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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 9, NUMBER 18
SEPTEMBER 15, 1976

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U.S. DEPARTMENT OF THE INTERIOR
OFFICE OF WATER RESEARCH AND TECHNOLOGY

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 18
SEPTEMBER 15, 1976

W76-09401 -- W76-10000

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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ABSTRACT SOURCES

2. WATER CYCLE

2A. General

WATERSHED RESPONSE TO PARTIAL AREA APPLICATIONS OF SIMULATED RAINFALL,
Northeastern Forest Experiment Station, Pennington, N. J.
E. S. Corbett, W. E. Sopper, and J. A. Lynch.
In: Proceedings International Symposium on Hydrological Characteristics of River Basins, Tokyo, Japan, Dec. 1-8, 1975, IAHS-AISH Publication No. 117, 1975, p. 63-73.

Descriptors: *Rainfall-runoff relationships, *Subsurface stormflow, *Interflow, *Hydrograph analysis, *Flow characteristics, *Simulated rainfall, Streamflow, Hydrology, Storm runoff, Base flow, Hydrographs, Experimental watersheds, Peak runoff, Recession curves, Sprinkler irrigation, Field capacity, Irrigation systems, Watersheds(Basins).
Identifiers: Partial area hydrology, Watershed response, Hydrologic behavior, Stormflow duration, Quickflow, Delayed flow, Stream channel, Lower slopes, Upper slopes, Hydrograph characteristics, Hydrograph components.

To investigate the hydrologic behavior and response of a small forested drainage basin, an irrigation system was designed to apply a uniform amount of simulated rainfall to parts or all of a 7.9-hectare watershed. Partial area analyses indicated that the source of stormflow during the rising limb of a storm hydrograph was dynamic, originating initially from the channel area and extending upslope as saturated soil conditions extended upslope. The duration of peakflow and the rate of decline of the recession limb up to the time that quickflow ended was controlled by the upper slope of the watershed. Quickflow accounted for most of the runoff regardless of the area of application; the channel and lower slope produced somewhat more than the upper slope and ridgetop. When watershed soils were at or near field capacity, 74% of a 48.8 mm simulated rainstorm (6.1 mm/hr) applied to the total watershed was discharged as quickflow. When the storms of the same size were applied to the ridge and upper slope, channel and lower slope, and channel areas only, 39%, 61%, and 52% of the applied rainfall was converted into quickflow. (Forest Service)
W76-09467

HYDROLOGIC SYSTEMS ANALYSIS MODEL FOR GENERATING RUNOFF TIME SERIES (HIDROLOGIAI) RENDSZERVIZSGALATI MODELL VIZHOZAMIDOSER ELOALLITASARA (II. RESZ),
BME Institute for Water Resources and Hydraulics, Budapest (Hungary).
I. Kontur.
Hidrologiai Kozlony, Vol. 56, No. 1, p 17-20, January, 1976. 4 ref.

Descriptors: *Runoff, *Hydrographs, *Model studies, Groundwater, Mathematical models, Infiltration, Evaporation, *Systems analysis.

Assuming that the catchment's runoff times are exponentially distributed, a flood wave is obtained which follows the gamma function. For its practical determination, two isochronous maps of the catchment must be prepared by assuming normal velocity for one and, for the other, the probable highest velocity. This method, which uses a probablistic model, is less sensitive to erroneous velocity estimates than one based on conventional catchment characteristics. The velocity distribution function's shape is also obtained as a by-product. The construction can be simplified further by assuming a constant ratio of the shortest to the normal runoff times. A model also considering infiltration and evaporation regards both underground and surface runoff as stochastic processes; as a result, the seepage velocity is also a random variable. Infiltration evaporation, and further precipitation flow are described by a random walk model. The model permits ready allowance for the reduced unit flood yield when the catchment area increases. The normal and maximum seepage velocities are parameters of the underground system. No spatial variation was assumed. The underground runoff hydrograph also assumes a gamma distribution shape. The model has been applied to determine a nonuniform slope section's runoff hydrograph. The model parameters were checked by analyzing the relationship of the stochastic model to the linear system. The combined approach to studying underground and surface runoff considers the hydrological processes' physical foundations more thoroughly than earlier models, and considers the water particles' potential paths using a random-walk formulation instead of using the hydrological processes. (Snyder-FIRL)
W76-09557

DISAGGREGATION MODELS IN HYDROLOGY REVISITED,
Ecole Polytechnique de Montreal (Quebec).
J. M. Mejia, and J. Rousselle.
Water Resources Research, Vol. 12, No. 2, p 185-186, April 1976. 5 ref.

Descriptors: *Synthetic hydrology, *Time series analysis, *Statistical models, Hydrology, Analytical techniques, Correlation analysis, Seasonal, Hydrologic data, Flow, *Model studies.
Identifiers: *Disaggregation models, Seasonal values, Model modification.

The synthesis of hydrologic sequences has been advanced as a useful tool in water resource systems. Valencia and Schaake developed a methodology for the disaggregation of synthesized yearly flow sequences in such a way that the statistics at different time resolutions were preserved. Though the data inside a given year preserve the statistics for all levels of aggregation, they are linked with the past only through the statistics at the yearly level. To overcome this shortcoming, a modification in the methodology was proposed and tested on 24 years of hydrologic information for two stations located in the watershed of the North River. The results supported the theory behind the modified model. (Singh-ISWS)
W76-09573

THE CONCENTRATION OF DISSOLVED SOLIDS AND RIVER FLOW,
Manhattan Coll., Bronx, N. Y. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-09577

SENSITIVITY OF LINEAR AND NONLINEAR SURFACE RUNOFF MODELS TO INPUT ERRORS,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh, and D. A. Woolhiser.
Journal of Hydrology, Vol. 29, No. 3/4, p 243-249, April 1976. 2 fig, 1 tab, 11 ref.

Descriptors: *Model studies, *Hydrologic data, *Precipitation excess, Hydrology, Storage, Peak discharge, Hydrographs, Rainfall-runoff relationships, Data collections, Surface runoff.
Identifiers: *Linear models, *Non-linear models, *Input errors.

The relationship between errors in runoff peak predictions by linear and nonlinear surface runoff models and errors in input intensity were examined. Usually the input into surface runoff models is the rainfall excess rate which may be incorrect because of sampling errors, because of spatial non-uniformity of the rainfall and the small number of sampling points, or because of bias in the amount of rain caught by the gages. It was shown that if input intensity errors are sufficiently large, a linear model optimally identified according to a least-squares criterion may perform better than a nonlinear model even though the system is truly nonlinear. (Lardner-ISWS)
W76-09578

CONCEPTUAL HYDROLOGICAL MODEL FOR AN AVERAGED-SIZED CATCHMENT AREA, I. CONCEPTS AND RELATIONSHIPS,
Institut Royal Meteorologique de Belgique, Brussels. Hydrology Section.
F. Bultot, and G. L. Dupriez.
Journal of Hydrology, Vol. 29, No. 3/4, p 251-272, April 1976. 5 fig, 6 ref.

Descriptors: *Hydrologic systems, *Mathematical models, Europe, *Watersheds(Basins), Rainfall-runoff relationships, Water yield, Infiltration, Runoff, Hydrology, Subsurface runoff, Water balance, *Model studies.
Identifiers: *Conceptual models.

The model enables the calculation, in daily values, of water transfers (interception by vegetation, evapotranspiration, surface runoff, infiltration, percolation, etc.) of the state of the different phases of the water cycle (water accumulated in the snow cover, in the vegetative cover, on the surface, in the zone of aeration, and in the zone of saturation of the soil, etc.) and of the flow at the outlet of the area (surface runoff, interflow and base flow). The aim of this model is to establish a detailed water balance of a catchment area, to follow its daily evolution, and to understand the factors that determine its nature. This work sets out the concepts and justifies the mathematical functions and relationships used. (See also W76-09580) (Lee-ISWS)
W76-09579

CONCEPTUAL HYDROLOGICAL MODEL FOR AN AVERAGE-SIZED CATCHMENT AREA, II. ESTIMATE OF PARAMETERS, VALIDITY OF MODEL, APPLICATION,
Institut Royal Meteorologique de Belgique (Brussels). Hydrology Section.
F. Bultot, and G. L. Dupriez.
Journal of Hydrology, Vol. 29, No. 3/4, p 273-292, April 1976. 6 fig, 4 tab, 2 ref.

Descriptors: *Hydrologic systems, *Mathematical models, *Watersheds(Basins), Europe, Rainfall-runoff relationships, Water yield, Infiltration, Runoff, Hydrology, *Model studies, Water balance.
Identifiers: *Validity of model, Parameter estimation, Conceptual model.

Methods used to determine parameters were described, the validity of the model was tested, and some of its applications were presented. The validity of the model was tested against data for the period 1966-1972, which was used for determining the parameters, and also against data for the year 1962. The results presented referred to: (1) The functioning of the model. Two figures relating to two periods chosen as examples show the simultaneous daily evolution of different variables and emphasize the complex interactions between water transfers and the daily state of the different phases of the water cycle. (2) Forecast. One figure supplied gives a comparative survey of the flows calculated and observed at the outlet of the catchment area during 1962 (a year that was not taken into account in determining the parameters). (3) The water balance of the catchment area. One table groups the values of the different terms of the water balance that can be estimated by using the model, and particularly in important intermediate terms such as recharge and the state of the groundwater. Only the monthly values are shown

in the table, whose primary purpose was to show the detailed character of the water balance which may be established by means of this model. (See also W76-09579) (Lee-ISWS)
W76-09580

DESIGN OF WATER RESOURCES PROJECT WITH INADEQUATE DATA IN INDIA - GENERAL AND PARTICULAR CASE STUDIES,
International Hydrological Decade, New Delhi (India). Indian National Committee.
For primary bibliographic entry see Field 4A.
W76-09621

HYDROLOGY FOR ENGINEERS, SECOND EDITION,
Stanford Univ., Calif.
For primary bibliographic entry see Field 8B.
W76-09661

A REVIEW AND ANALYSIS OF SELECTED HYDROLOGIC MODELING CONCEPTS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2E.
W76-09718

NATIONAL SYMPOSIUM ON URBAN RAINFALL AND RUNOFF AND SEDIMENT CONTROL,
Kentucky Univ. Lexington, Coll. of Engineering.
For primary bibliographic entry see Field 4C.
W76-09729

OVERVIEW OF RAINFALL-RUNOFF PROCESS IN URBAN AREAS,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
C. T. Haan.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control: Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 1-13, October 1974. 14 fig, 6 tab, 10 ref.

Descriptors: *Urban runoff, *Precipitation(Atmospheric), *Rainfall-runoff relationships, Hydrologic cycle, Rainfall, Reviews, Streamflow, Hydrographs, Water loss, Infiltration, Hydrologic equation, Channels, Channel flow, Roughness(Hydraulic), Frequency analysis, Flow, Peak discharge, Depth-area-duration analysis, Flood frequency, Design storm, Design data, Hydrology, Urban hydrology.

This paper covered some of the basic principles and terminology associated with urban hydrology. It was primarily intended as background or briefing material for those not already well versed in hydrology. This paper is a primer on urban hydrology which explains some basic hydrologic concepts, commonly used terminology, and currently used methods in urban hydrology. (See also W76-09729) (Sims-ISWS)
W76-09730

RUNOFF FREQUENCY PROCEDURE FOR SYNTHETIC HYDROGRAPH DEVELOPMENT,
Colorado Univ., Denver.
W. C. Hughes.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 41-43, October 1974. 4 fig, 2 ref.

Descriptors: *Rainfall-runoff relationships, *Hydrographs, *Analytical techniques, Runoff, Rainfall, Precipitation(Atmospheric), Design data, Design storm, Frequency curves, Frequency analysis, Precipitation excess, Probability, Hydrology.

A method was proposed for determining the runoff volume, or precipitation excess, of given recurrence interval when only precipitation data is available. In the proposed method the joint probability associated with a given precipitation volume and a given basin runoff coefficient was shown to approximate the exceedance probability associated with the resulting runoff volume, where the basin runoff coefficient and its probability of occurrence are a function of the antecedent precipitation index. The method was tested using data from two basins and was shown to generate runoff volumes of reasonable comparison with the actual runoff frequency curves. (See also W76-09729) (Sims - ISWS)
W76-09733

VERIFICATION OF NUMERICAL MODELS OF LAKE ONTARIO, III. LONGTERM HEAT TRANSPORTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W76-09783

ROLE OF CARBONATE ROCKS IN MODIFYING FLOOD FLOW BEHAVIOR,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
E. L. White.
Water Resources Bulletin, Vol. 12, No. 2, p 351-370, April 1976. 5 fig, 7 tab, 19 ref, 1 append.

Descriptors: *Carbonate rocks, *Flood flow, *Karst, Drainage effects, Subsurface drainage, Karst hydrology, Runoff, Peak discharge, Watersheds(Basins), Drainage area, Topography, Sinks, Internal water, Limestones, Correlation analysis, Stochastic processes, Groundwater, Flood forecasting.
Identifiers: *Mean annual food, *Multivariate analysis, *Factor analysis, *Cluster analysis, Variance, Binary correlation, Basin parameters.

The interrelationships between the runoff characteristics of watersheds (expressed as the mean annual flood), standard basin parameters (area, drainage properties, and relief), and the parameters which describe the solutional modification of the basins (carbonate rock fractions, sinkhole development, and measures of internal drainage) were used to group 62 carbonate watersheds. Simple binary correlations were obtained by direct plotting of the data. This was followed by multivariate analyses: factor and cluster analyses. Following the cluster analysis, which separated the basins into three groups, the variance within each group was examined again by binary correlations and by factor analysis. Predictions equations for those basins underlain by dolomite rock and for those basins underlain by carbonate rock with very little surface expression were proposed. Basins underlain by karstic limestone had a large amount of variance within the data set; therefore no prediction equation could be obtained. (Visocky - ISWS)
W76-09784

NATIONAL CONFERENCE OF DISTRICT CHIEFS, ALBUQUERQUE, NEW MEXICO, SEPTEMBER 28-OCTOBER 3, 1975--PROCEEDINGS,
Geological Survey, Reston, Va.
Open-file report 76-467, 1976. 133 p. E. B. Chase, editor.

Descriptors: *Conferences, *Water resources development, *Project post-evaluation, *Project planning, *Project purposes, Projections, Water supply, Water demand, Water quality, Water conservation, Hydrologic budget, Natural resources, Land use.
Identifiers: Conference proceedings.

This proceedings volume summarizes a conference held every five years by the U.S. Geological Survey's Water Resources Division. Subjects covered are the role of Water Resources Division District Chiefs as Geological Survey Representative, the state of the Water Resources Division, and plans and programs for the next five years. (Woodard-USGS)
W76-09838

ESTIMATING SELECTED PARAMETERS FOR THE KENTUCKY WATERSHED MODEL FROM WATERSHED CHARACTERISTICS,
Virginia State Water Control Board, Richmond.
W. L. Magette, V. O. Shanholtz, and J. C. Carr.
Water Resources Research, Vol. 12, No. 3, p 472-476, June 1976. 2 fig, 3 tab, 14 ref.

Descriptors: *Watersheds(Basins), *Mathematical models, *Estimating, *Parametric hydrology, Simulation analysis, Streamflow, Drainage, Basins, Regression analysis, Computers, Systems analysis, Optimum development plans, Water supply, Model studies, Forecasting.
Identifiers: Ungaged areas, Multiple regression models, Synthetic flows, *Kentucky watershed model.

Competition among users for a relatively fixed supply of water has focused attention on the need for effective means to plan for the optimum use of this resource. Parametric models, which lend themselves to computer application and attempt to simulate the hydrologic cycle, have become recognized as useful aids to such planning. Herein, multiple linear equations to predict selected parameters for the Kentucky watershed model (KWM) have been presented. The independent variables consist of easily determinable watershed characteristics. The relationship provides a means by which the KWM can be used to predict streamflows from ungaged drainage basins. Examples are given for five test watersheds, yielding variable results. (Bell-Cornell)
W76-09852

PARAMETER OPTIMIZATION FOR WATERSHED MODELS,
New South Wales Univ., Kensington, Australia. School of Civil Engineering.
P. R. Johnston, and D. H. Pilgrim.
Water Resources Research, Vol. 12, No. 3, p 477-486, June 1976. 13 fig, 16 ref.

Descriptors: *Watersheds(Basins), *Mathematical models, *Parametric hydrology, *Optimization, Numerical analysis, Performance, Value, Soil moisture, Drainage, Systems analysis, Model studies.
Identifiers: Algebraic analysis, *Boughton model.

A detailed search for the optimum values of the parameters of the Boughton model is described. The Simplex and Davidon optimization methods were used. Rapid initial reductions in the objective function were readily achieved, but the solutions approached several widely different apparent optima. Alternate use of different optimization methods and numerical and algebraic studies enabled considerable further progress to be made in the search. Much information was obtained on various aspects of parameter optimization. These include interdependence and indifference of parameters, the form of the response surface and the occurrence of discontinuities, the required length of the 'warm-up' period for different types of stores, and the effects of using different types of objective functions. As typical stores were analyzed and the only basic assumption involved was that the data contained errors, the findings should apply to most watershed models. (Bell-Cornell)
W76-09853

SYMPOSIUM ON MODELING TECHNIQUES, VOLUME I.
American Society of Civil Engineers, New York.
Proceedings of the 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE, San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, 1975. 801 p.

Descriptors: *Model studies, *Mathematical models, *Hydraulic models, Navigation, Harbors, Marinas, Waves(Water), Ocean waves, Hydrodynamics, Channels, Sedimentation, Rivers, Inlets(Waterways), Discharge(Water), Jets, Mixing, Flow, Streamflow, Estuaries, Tidal effects, Water quality, Environment, Hydraulics.

The objective of this symposium was to provide a forum in which the state-of-the-art of various types of models could be discussed and to provide a mechanism by which not only the relative merits of mathematical and physical models could be reviewed but also, and more fundamentally, the applicability of models to specific problems could be evaluated. The program focused on nearly all aspects of modeling as applied to rivers, harbors, oceans, and coastal areas. This volume contained the papers from sessions on navigation and port facilities, wave dynamics, environment modeling, inlets, discharges, jets, and mixing, mathematical river models, river structures, estuaries, and water quality. (See W76-09942 thru W76-09984) (Sims - ISWS)
W76-09941

ST. LAWRENCE SEAWAY: A NEW GOAL OF YEAR-ROUND NAVIGATION,
ARCTEC, Inc., Columbia, Md.
For primary bibliographic entry see Field 2C.
W76-09942

SPECIFICATIONS FOR CONTAINER FACILITIES BY SIMULATION,
For primary bibliographic entry see Field 6A.
W76-09943

HYDROLOGIC FORECASTING FOR THE OHIO RIVER WATERWAY,
National Weather Service, Cincinnati, Ohio. River Forecast Center.
For primary bibliographic entry see Field 2E.
W76-09944

HYBRID-ELEMENT METHOD FOR WATER WAVES,
Massachusetts Inst. of Tech., Cambridge, Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
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LARGE WAVE CHANNEL FOR 'FULL SCALE-MODELING' OF WAVE DYNAMICS IN SURF ZONES,
Technische Hochschule, Hanover (West Germany). Franzius-Institut fuer Grund und Wasserbau.
For primary bibliographic entry see Field 8B.
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WAVE MOTIONS IN AN OFFSHORE HARBOR,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 8B.
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MODELING OF WIND-WAVES WITH JONSWAP SPECTRA,
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USE OF MATHEMATICAL MODELS IN THE PALO ALTO MARSHLAND REHABILITATION PROJECT,
Water Resources Engineers, Walnut Creek, Calif.
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Water Resources Engineers, Inc., Austin, Tex.
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ORGANIC SEDIMENT MODEL FOR WASTEWATER OUTFALL,
Tetra Tech, Inc., Lafayette, Calif.
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SOME HARD LESSONS IN NUMERICAL HYDRAULICS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
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SIMULATION OF TIDAL HYDRODYNAMICS - MASONBORO INLET,
Water Resources Engineers, Inc., Austin, Tex.
For primary bibliographic entry see Field 8B.
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RIVER DELTA COMPUTER SIMULATION MODEL (SIMUDELT),
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
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ANISOTROPIC SAND TRANSPORT IN TIDAL INLETS,
Foundation for Ocean Research, San Diego, Calif.
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MODELING SEDIMENT MOVEMENT FOR MASONBORO INLET,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
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Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
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PRINCIPLE OF MANAGEMENT OF DEGENERATED INLETS AND ESTUARIES,
Laval Univ., Quebec. Dept. of Civil Engineering.
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Delaware Univ., Newark. Dept. of Civil Engineering and Marine Studies.
For primary bibliographic entry see Field 5B.
W76-09959

TEMPERATURE PREDICTIONS FOR OFFSHORE POWER PLANTS,
Massachusetts Inst. of Tech., Cambridge. Energy Lab.
For primary bibliographic entry see Field 5B.
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SAMPLING NETWORK DESIGN FOR DISPERSION VERIFICATION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-09961

NEAR-FIELD JET PENETRATION AND RESERVOIR MIXING,
Georgia Inst. of Technology, Atlanta.
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PHYSICAL MODEL OF DISCHARGE IN A TWO-LAYER STRATIFIED AMBIENT,
Duke Power Co., Charlotte, N. C.
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W76-09963

NUMERICAL TWO-DIMENSIONAL FLOW MODEL FOR RIVER SYSTEMS,
Waterloo Univ. (Ontario). Dept. of Systems Design.
For primary bibliographic entry see Field 2E.
W76-09964

TWO-DIMENSIONAL MODEL OF FLOW TOWARD INTAKES,
Nuclear Regulatory Commission, Washington, D.C. Hydrologic Engineering Section.
For primary bibliographic entry see Field 2E.
W76-09965

MATHEMATICAL MODEL OF FLOW IN A STREAM-AQUIFER SYSTEM,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-09966

FORECASTS FOR THE SACREMENTO RIVER SYSTEM,
National Weather Service, Sacramento, Calif. River Forecast Center.
For primary bibliographic entry see Field 2E.
W76-09967

MATHEMATICAL MODELING OF ALLUVIAL CHANNELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-09968

MOVABLE-BED RIVER-MODELS,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 2E.
W76-09969

SEDIMENT DEPOSITION MODEL FOR TARBELA RESERVOIR,
Gilbert Associates, Inc., Reading, Pa.
For primary bibliographic entry see Field 2J.
W76-09970

UNDISTORTED MOVABLE-BED MODEL STUDY FOR A RIVER AND POWER PLANT INTAKE SYSTEM,
Battelle Memorial Inst., Richland, Wash.
For primary bibliographic entry see Field 8B.
W76-09971

PHYSICAL MODELING TECHNIQUES USED IN RIVER MODELS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. River Regulation Branch.
For primary bibliographic entry see Field 2E.
W76-09972

RIVERBANK RECESSIONS FOR POWER PLANT FACILITIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-09973

MODELING OF MEANDERING AND BRAIDING IN RIVERS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W76-09974

MODELING SEDIMENT TRANSPORT IN HYDRAULIC STRUCTURES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W76-09975

SYSTEMS MODELING OF STRATIFIED FLUIDS,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Center.
For primary bibliographic entry see Field 8B.
W76-09976

MODELING OF THREE-DIMENSIONAL FLOWS IN ESTUARIES,
Rand Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 2L.
W76-09977

RESULTS OF SALINITY TESTS ON THE SAN FRANCISCO BAY-DELTA HYDRAULIC MODEL,
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 2L.
W76-09978

EXPERIENCE WITH A SMALL SCALE, HIGHLY DISTORTED FIXED BED MODEL OF THE LAGO MARACAIBO ESTUARY,
Laboratorio National de Hidraulica, Caracas (Venezuela).
For primary bibliographic entry see Field 2L.
W76-09979

HYDRODYNAMIC TRANSPORT PHENOMENA IN ESTUARIES AND COASTAL WATERS: SCOPE OF MATHEMATICAL MODELS,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 5B.
W76-09980

APPLICATION OF WATER QUALITY MODELS TO FINGER FILL CANALS,
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5B.
W76-09981

RIVER AND ESTUARY MODELING WITH THE SIVA SYSTEM,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Centre.
M. B. Abbott, K. I. Dahl-Madsen, P. I. Hinstrup, A. Kej, and M. P. Vium.
In: Symposium on Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.). San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 745-763, 1975. 6 fig, 5 ref.

Descriptors: *Model studies, *Mathematical models, *Estuaries, *Rivers, Fjords, Computer models, Flow, Storm surge, Tides, Water levels, Tidal effects, Biological properties, Algae, Zooplankton, Nutrients, Pollutants, Sedimentation, Hydrodynamics, Hydraulics.
Identifiers: *Denmark.

The System 11, 'Siva', is a design system capable of constructing and running almost any model of one-dimensional one-layer (vertically homogeneous) flow when presented only with the specific model description consisting of: the points in the model and the way they are connected, the cross sections at each of these representative points, the resistance properties of the bed, ancillary data (such as lateral discharges and wind stress) and boundary data (such as elevations or discharges). The system-built model can incorporate extensive flood plains, it can be multiply connected, and it can accomodate rapid changes of section. The system incorporates routines for computing water quality indicators, including a transport-dispersion routine, a heat transfer routine, and the biochemical reaction routine for algal carbon, zooplankton carbon, detritus carbon, inorganic phosphorus and inorganic nitrogen. These routines can be coupled together so that the discharges and flow areas given by the hydrodynamic stages of the system can be used to calculate the transport, dispersion and interaction of the main biochemical indicators. The System 11, 'Siva', has been extensively field tested for the case of a Danish Fiord, the Limfiord, which is multiply connected and has a total length of about 100 miles. This fiord is open at both ends to the sea, where it is subject to tidal and storm surge variations, while its internal conditions are also much affected by wind. (See also W76-09941) (Sims-ISWS)
W76-09982

HYDRODYNAMIC AND MATERIAL TRANSPORT MODEL FOR MOBILE BAY, ALABAMA,
Alabama University, University. Department of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-09983

APPLICATION OF PHYSICAL TIDAL MODELS IN HARBOR AND MARINA DESIGN,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-09984

2B. Precipitation

MICRO-CLIMATE EFFECTS ON WATER USE EFFICIENCY BY PLANTS IN AN ARID CLIMATE,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
For primary bibliographic entry see Field 3B.
W76-09480

THE SAHELIAN DROUGHT AND ITS DEMOGRAPHIC IMPLICATIONS,
Australian National University, Canberra, Department of Demography.
For primary bibliographic entry see Field 6G.
W76-09486

EVALUATION OF MEAN SQUARE ERROR INVOLVED IN APPROXIMATING THE AREAL AVERAGE OF A RAINFALL EVENT BY A DISCRETE SUMMATION,
Puerto Rico Univ., Mayaquez. Dept. of Civil Engineering.
R. L. Bras, and I. Rodriguez-Iturbe.
Water Resources Research, Vol. 12, No. 2, p 181-184, April 1976. 3 fig, 8 ref. NWS 4-36738.

Descriptors: *Rainfall, *Data processing, *Networks, Mathematics, Mathematical studies, Analytical techniques, Average, Correlation analysis, Precipitation(Atmospheric), Hydrology.
Identifiers: Mean square error.

Two-dimensional areal processes are commonly evaluated in hydrology through a discretization in space over the region in which the process is being studied. Such a discretization involves an error in going from the continuous process to the discrete one. This error was studied theoretically, and graphs were presented for its evaluation as function of the size of the area, the functional form of the correlation equation in space, and the level of discretization or size of the sample. Correlation structures of the Bessel type and of the single and double exponential kind were considered, and their different implications were discussed. (Sims-ISWS)
W76-09572

ACCURACY OF RESERVOIR INFLOW FORECASTS BASED ON RADAR RAINFALL MEASUREMENTS,
Karlsruhe Univ. (West Germany). Institut fuer Wasserbau III.
B. Anderl, W. Attmannspacher, and G. A. Schultz.
Water Resources Research, Vol. 12, No. 2, p 217-223, April 1976. 6 fig, 2 tab, 15 ref.

Descriptors: *Rainfall, *Radar, *Hydrographs, Runoff, Floods, Inflow, Reservoirs, Computers, Computer models, Mathematical models, Watersheds(Basins), Measurement, Instrumentation, Precipitation(Atmospheric), Meteorology.
Identifiers: *West Germany.

For efficient application of optimum operating procedures to flood protection reservoirs it is essential to forecast on line, i.e., during a storm, the relevant inflow hydrographs. This can be achieved with the aid of a weather radar linked to a computer in which the optimum reservoir operating program is stored as well as a program of a hydrologic rainfall-runoff model producing the reservoir inflow hydrographs from radar-measured rainfall data. These inflow hydrographs may be evaluated on the computer during each storm event and can be updated every 5 min, if necessary. The accuracy of these computed hydrographs was tested against the recordings of two river gages installed in catchments close to a weather radar at Hohenpeissenberg in Upper Bavaria. By using a linearly distributed mathematical catchment model it was shown that for the two rivers the synthetic hydrographs computed from radar-measured rainfall were more accurate than those obtained from continuous measurements of the official point rain gage network of the German Weather Service (one recording gage in 500 sq km) and that they were of the same accuracy as those obtained from a special very dense rain gage network (one recording gage in 25 sq km) set up for research purposes in the same area. (Sims-ISWS)
W76-09574

ON THE RAINFALL AND WATER POTENTIAL OF NEPAL,
Andhra Univ., Waltair (India). Dept. of Meteorology and Oceanography.
J. Subbaramayya, and V. R. Babu.
Indian Journal of Power and River Valley Development, Vol. XXV, No. 3, p 95-97, March 1975. 6 fig, 1 tab, 10 ref.

Descriptors: *Orography, *Rainfall, *Water resources, Evapotranspiration, Topography, Meteorology, Hydrologic data.

Identifiers: *Nepal(India), Water potential, Water surplus.

The rainfall of Nepal is studied for purposes of understanding the nature of orographic influence. The water potential of the country is examined from a hydro-meteorological point of view. It is found that topographical features like valleys and ridges and their exposure to wind, and the steepness of the mountain slopes, play an important role in fixing the areas of maximum rainfall rather than does the mere elevation. The country has a net surplus of rain-water amounting to about 2.04x10 in. cubic metres. (Bell-Cornell)
W76-09642

A MODEL FOR THE THERMODYNAMIC GROWTH OF SEA ICE IN NUMERICAL INVESTIGATIONS OF CLIMATE,
Rand Corp., Santa Monica, Calif. Climate Dynamics Program.
For primary bibliographic entry see Field 2C.
W76-09722

THE DISTRIBUTION OF HEAVY RAINFALL IN A MAJOR URBAN AREA,
Illinois State Water Survey, Urbana.
F. A. Huff.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 53-60, October 1974. 5 fig, 2 tab, 8 ref.

Descriptors: *Rainfall, *Excessive precipitation, *Cities, *Rainfall disposition, Precipitation(Atmospheric), Precipitation intensity, Networks, Rain gages, Distribution patterns, Urban runoff, Hydrology, Meteorology.
Identifiers: *St. Louis(Mo), Urban effects.

Since 1971, a network of 225 recording raingages has been operated within a 26-mile radius of St. Louis in conjunction with an extensive 5-year investigation of urban effects on precipitation. Since improved sewer design and engineering is a current hydrologic problem of major interest, the network data are being analyzed to provide information applicable to this need. This paper summarized initial findings obtained from analyses of the 100 heaviest raincells recorded on the network during the summers of 1971-72 and the two-year pattern of storms producing one inch or more of rainfall. Results indicated a substantial increase in rainfall yield from raincells exposed to potential urban effects compared with no-effect cells. The one-inch rainfall pattern shows a distinct maximum in a region that is frequently in the path of storms passing across the two urban-industrial areas of St. Louis and Alton-Wood River. It was concluded that if these preliminary findings are verified in the remaining years of the project that frequency relations used in the design of urban and suburban systems will need to be re-evaluated to incorporate significant urban effects upon storm runoff. (See also W76-09729) (Sims - ISWS)
W76-09734

RELATIONSHIP OF HEAVY RAINFALL TO SOIL EROSION IN VIEW OF ITS FORECASTING, (IN BULGARIAN),
Afforestn. Erosion Control Experimental Station, Sandanski (Bulgaria).
For primary bibliographic entry see Field 2J.
W76-09807

METEOROLOGICAL FACTORS AND DISEASE EXPRESSIONS IN JUTE,
Jute Agricultural Research Inst., Barrackpore (India). Mycology and Plant Pathology Div.
For primary bibliographic entry see Field 3F.
W76-09931

2C. Snow, Ice, and Frost

A MODEL FOR THE THERMODYNAMIC GROWTH OF SEA ICE IN NUMERICAL INVESTIGATIONS OF CLIMATE,
Rand Corp., Santa Monica, Calif. Climate Dynamics Program.
A. J. Semtner, Jr.
Journal of Physical Oceanography, Vol. 6, No. 3, p 379-389, May 1976. 8 fig, 2 tab, 8 ref, 1 append.

Descriptors: *Sea ice, *Climates, *Model studies, Mathematical models, Oceans, Ice, Snow, Weather, Atmosphere, Melting, Temperature, Heat transfer, Heat balance, Heat flow, Oceanography, Meteorology.
Identifiers: *Ice thickness.

A model was presented whereby the thickness and extent of sea ice may be predicted in climate simulations. A basic one-dimensional diffusion process was taken to act in the ice, with modifications due to penetration of solar radiation, melting of internal brine pockets, and accumulation of an insulating snow cover. This formulation is similar to that of a previous study by Maykut and Untersteiner, but the introduction of a streamlined numerical method makes the model more suitable for use at each grid point of a coupled atmosphere-ocean model. In spite of its simplicity, the ice model accurately reproduces the results of Maykut and Untersteiner for a wide variety of environmental conditions. In 25 paired experiments, annual average equilibrium thicknesses of ice agreed within 24 cm for 75% of the cases; and the average absolute error for all cases was 22 cm. The new model has fewer computational requirements than one layer of ocean in the polar regions, and it can be further simplified if additional savings of computer time are desired. (Sims - ISWS)
W76-09722

OIL IN THE ARCTIC,
Massachusetts Inst. of Tech. Cambridge.
For primary bibliographic entry see Field 5C.
W76-09902

EFFECTS OF PETROLEUM POLLUTANTS ON ARCTIC MICROBIAL POPULATIONS,
Louisville Univ., Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-09909

AN ENVIRONMENTAL RESEARCH PROGRAM FOR DRILLING IN THE CANADIAN BEAUFORT SEA,
Gulf Oil Canada Ltd., Calgary (Alberta).
For primary bibliographic entry see Field 5G.
W76-09912

ST. LAWRENCE SEAWAY: A NEW GOAL OF YEAR-ROUND NAVIGATION,
ARCTEC, Inc., Columbia, Md.
T. V. Kotras, J. W. Lewis, and D. C. N. Robb.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 1-22, 1975. 5 fig, 1 tab, 12 ref.

Descriptors: *Model studies, *St. Lawrence Seaway, *Winter, *Ice, *St. Lawrence River, Mathematical models, Rivers, Locks, Lakes, Navigation, Economics, Ice breakup, Iced lakes, Ice cover, Lake ice, Canals.
Identifiers: All-year navigation.

For almost a third of each year, commercial ship traffic ceases movement on the St. Lawrence River between Montreal and Lake Ontario because of problems associated with the presence of ice in the river. As a step towards changing this situation, an investigation, referred to as the SPAN (System Plan for All-year Navigation) STUDY, of the economic feasibility of year-round navigation in this section of the river was recently completed. To assist in this investigation, a computer simulation model of the Seaway was developed to simulate the movement of ships through the Seaway during both normal conditions and winter ice months. The simulation determined the navigability of the Seaway, measured by the ship transit times and the Seaway capacity (ships/day), by processing ships through the Seaway while incorporating the effects of ice, weather, time of year, winter severity, amount of traffic, and types of ships navigating the Seaway. Use of the simulation provided a solid, rational basis for evaluation of the technological, economic, and environmental feasibility of extended season navigation on the St. Lawrence Seaway. It also provided a means of predicting the influence of ice control structures, installation of fixed aids to navigation, ice clearing ships, heating systems, bubbler systems, etc., on extended season navigation. This simulation model of the Seaway was described and some of the results of the investigation were presented. (See also W76-09941) (Sims - ISWS)
W76-09942

WATER TRANSPORT IN THE SILL AREA OF BALSFJORD NORTH NORWAY, DURING VERNAL MELTWATER DISCHARGE,
Tromsoe Univ. (Norway). Inst. of Biology and Geology.
For primary bibliographic entry see Field 2L.
W76-09999

2D. Evaporation and Transpiration

MICRO-CLIMATE EFFECTS ON WATER USE EFFICIENCY BY PLANTS IN AN ARID CLIMATE,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
For primary bibliographic entry see Field 3B.
W76-09480

EFFECTIVENESS OF WATER UTILIZATION BY PLANTS, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii and Agrokhimii.
S. I. Slukhai, K. S. Tkachuk, and T. Y. Kuzycheva.
Dopov Akad Nauk Ukr RSR Ser B Heol Heofiz Khim Biol. 36(4), p 368-371, 1974.

Descriptors: *Water utilization, Drought, Wheat, *Transpiration, Soil moisture, Moisture content, *Drought tolerance, *Plant physiology, Dehydration.

The influence of soil drought on effectiveness of water utilization by winter wheat was studied in connection with different indices of water regime. An increase in efficiency of transpiration under conditions of constant soil moisture deficiency (40% of total moisture-holding capacity) was connected with stabilization of plants water regime. Influence of sudden soil drought upon plants resulted in sharp tissue dehydration and reduction of plant transpiration efficiency.
W76-09809

CENOZOIC DEPOSITS OF SOUTHEASTERN NEW MEXICO AND AN OUTLINE OF THE HISTORY OF EVAPORITE DISSOLUTION,
Geological Survey, Colo.
For primary bibliographic entry see Field 2J.
W76-09837

EVAPORATION FROM HIGHLY SALINE SOILS IN AN EXPERIMENTAL PLOT IN THE TURKMEN SSR, (IN RUSSIAN),
Kh. Zamanmurad, and K. Bekiev.
Probl Osvoeniya Pustyn'. 3, p 66-70, 1974.

Descriptors: *Saline soils, *Evaporation, Salinity, Salts, Soil surfaces, Mineral water, Groundwater.
Identifiers: Turkmen-SSR, *USSR.

Evaporation of shallow ground waters from the highly saline soils is less than from non-saline ones. The annual course of evaporation is greatly influenced by the rate of salinity, composition of mineral salts and the type of soil surface salt cover.--Copyright 1975, Biological Abstracts, Inc.
W76-09887

2E. Streamflow and Runoff

WATER SYSTEM BEHAVIOR: DETERMINANTS IN AN ARID REGION,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 4A.
W76-09483

DISAGGREGATION MODELS IN HYDROLOGY REVISITED,
Ecole Polytechnique de Montreal (Quebec).
For primary bibliographic entry see Field 2A.
W76-09573

IDENTIFICATION OF LINEAR SYSTEMS RESPONSE BY PARAMETRIC PROGRAMING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
S. P. Neuman, and G. D. Marsily.
Water Resources Research, Vol. 12, No. 2, p 253-262, April 1976. 18 fig, 23 ref.

Descriptors: *Input-output analysis, *Hydrograph analysis, *Runoff forecasting, Analytical techniques, *Linear programming, Hydrologic systems, Hydrology, Decision making, Hydrologic data, Precipitation(Atmospheric).
Identifiers: *Parametric programming, Multicriterion decision process, Bicriterion function, Impulse response function.

The impulse response function of a linear hydrologic system is extremely sensitive to minor errors in the input-output data. Low-amplitude random errors can cause severe oscillations in the response function. Objective methods are not available for filtering the input-output data to obtain physically realizable solutions. The ultimate goal of response function identification is to determine a solution which optimizes the predictive capabilities of the linear model. An important criterion of optimality is that the shape of the response function be physically plausible. Use of parametric linear programming was proposed to achieve this objective. The problem was formulated as a multicriterion decision process under uncertainty. Parametric programming served as a means of generating a continuous set of alternative solutions to the identification problem together with a bicriterion function representing these alternatives. The shape of the bicriterion curve was then used as a guide by the hydrologist in selecting a particular solution when he is relying on his own value judgment. (Singh-ISWS)
W76-09575

THE CONCENTRATION OF DISSOLVED SOLIDS AND RIVER FLOW,
Manhattan Coll., Bronx, N. Y. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-09577

SENSITIVITY OF LINEAR AND NONLINEAR SURFACE RUNOFF MODELS TO INPUT ERRORS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2A.
W76-09578

CONCEPTUAL HYDROLOGICAL MODEL FOR AN AVERAGED-SIZED CATCHMENT AREA, I. CONCEPTS AND RELATIONSHIPS,
Institut Royal Meteorologique de Belgique, Brussels. Hydrology Section.
For primary bibliographic entry see Field 2A.
W76-09579

CONCEPTUAL HYDROLOGICAL MODEL FOR AN AVERAGE-SIZED CATCHMENT AREA, II. ESTIMATE OF PARAMETERS, VALIDITY OF MODEL, APPLICATION,
Institut Royal Meteorologique de Belgique (Brussels). Hydrology Section.
For primary bibliographic entry see Field 2A.
W76-09580

A REVIEW AND ANALYSIS OF SELECTED HYDROLOGIC MODELING CONCEPTS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
J. L. Nieber, M. F. Walter, and R. D. Black.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-254 489, $4.50 in paper copy, $2.25 in microfiche. Cornell University Water Resources and Marine Sciences Center, Ithaca, Technical Report, June 1976. 66 p., 10 fig., 3 tab., 68 ref. OWRT A-061-NY(1), 14-31-0001-5032.

Descriptors: *Model studies, *Runoff, *Forecasting, Reviews, *Watershed management, Watersheds(Basins), Estimating, Base flow, Infiltration, Precipitation excess, Evaporation, Routing.
Identifiers: *Kinematic wave approximation, *Watershed runoff models.

Reviews and analyses were made of several selected hydrologic watershed runoff models that have been commonly used for forecasting floods and water supply. The three approaches to hydrologic modeling, deterministic, parametric, and stochastic, are compared to emphasize the advantages and disadvantages of each. A review of the literature gives the general development of rainfall excess routing techniques, infiltration and evaporation determination techniques and techniques for estimating groundwater flow. Aproaches of integrating these process submodels into a total watershed runoff model are considered. Several selected watershed modeling packages presently in use are discussed relative to origin, concept, and usefulness. The mathematical formulations are given for the kinematic wave approximation, the linearization of the kinematic wave equation, and the finite difference approximation to the equations for the linear reservoir and linear channel routing concepts. The comparative sensitivity of these various conceptual models to changes in the physical character of watersheds is analyzed.
W76-09718

RELATIONSHIP OF RATIONAL AND UNIT GRAPH METHODS IN RETENTION BASIN DESIGN,
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4C.
W76-09732

ILLUDAS - THE ILLINOIS URBAN DRAINAGE AREA SIMULATOR,
Illinois State Water Survey, Urbana.
M. L. Terstriep, and J. B. Stall.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 73-83, October 1974. 8 fig, 5 tab, 20 ref.

Descriptors: *Model studies, *Computer models, *Urban drainage, Mathematical models, Computer programs, Urban runoff, Basins, Watersheds(Basins), Paving, Grassed waterways, Roofs, Hydrographs, Infiltration, Soil water, Storage, Runoff, Retention, Detention reservoirs, Cities, Hydrology, Urban hydrology.

An objective method was presented for the hydrologic design of storm drainage systems in urban areas. The method is based on a digital model to be known as ILLUDAS, the Illinois Urban Drainage Area Simulator. ILLUDAS uses an observed or specific temporal rainfall pattern uniformly distributed over the basin as the primary input. The basin is divided into sub-basins, one for each design point in the basin. Paved-area and grassed-area hydrographs are produced from each sub-basin by applying the rainfall pattern to the appropriate contributing areas. These hydrographs are combined and routed downstream from one design point to the next until the outlet is reached. Pipe sizes are determined at each design point. Detention storage can be included as part of the design in any sub-basin. (See also W76-09729) (Sims-ISWS)
W76-09735

REMEDIAL MEASURES FOR URBAN FLOOD PEAK REDUCTION,
Georgia Inst. of Tech. Atlanta. School of Civil Engineering.
A. M. Lumb, L. D. James, and A. Johnson.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 85-91, October 1974. 4 fig, 5 tab, 12 ref.

Descriptors: *Model studies, *Urban runoff, *Flood peak, Mathematical models, Computer models, Computer programs, Watersheds(Basin), Paving, Grassed waterways, Roofs, Hydrographs, Hydraulics, Infiltration, Retention, Detention reservoirs, Cities, Rainfall, Runoff, Roughness(Hydraulic), Hydrology, Urban hydrology.

This study tested remedial measures for the reduction of flood peaks in urban areas through the use of a hydrologic model for the digital computer. The fact that urbanization in a watershed generally increases peak flow rates over those in the nonurbanized watershed is well documented. However, if the urbanization could be undertaken in a manner to minimize increases in runoff, then significant savings in drainage structures could possibly be realized and degradation of the downstream environment could be reduced. The methodology of this study included: (1) instrumentation of a small residential watershed, (2) development of a hydrologic model, (3) calibration and verification of the model, and (4) model simulation with hypothesized remedial measures for peak flow reduction. For the 11-acre residential watershed used in this study and for the assumptions that were made, the 20% increase in the peak flow from residential development could be reduced that amount with a combination of remedial measures including terracing, directing flow from downspouts onto lawns and the use of artificially roughened or vegetated channels. Detention storage could also achieve the 20% reduction in peak flows. (See also W76-09729) (Sims - ISWS)
W76-09736

A FLOOD MANAGEMENT MODEL FOR URBANIZING RIVER BASINS,
Massachusetts Inst. of Tech. Cambridge. Dept. of Civil Engineering.

For primary bibliographic entry see Field 4C.
W76-09737

PHYSICAL AND ECONOMIC ASPECTS ASSOCIATED WITH RUNOFF FROM URBAN GROWTH: A METHODOLOGICAL APPROACH,
Iowa Univ., Iowa City. Dept. of Economics.
For primary bibliographic entry see Field 4C.
W76-09749

MANAGEMENT OF FLOOD CONTROL AND DRAINAGE IN THE URBANIZING ZONE,
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
For primary bibliographic entry see Field 4A.
W76-09750

ROLE OF CARBONATE ROCKS IN MODIFYING FLOOD FLOW BEHAVIOR,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 2A.
W76-09784

REGRESSION ANALYSIS AND PARAMETER IDENTIFICATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W76-09824

HYDROLOGIC UNIT MAP--1974, STATE OF ALASKA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-09826

HYDROLOGIC UNIT MAP--1974, STATE OF OREGON,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-09827

APPRAISAL OF WATER RESOURCES OF NORTHWESTERN EL PASO COUNTY, COLORADO,
Geological Survey, Denver, Colo.
R. K. Livingston, D. L. Bingham, and J. M. Klein.
Colorado Water Conservation Board, Denver, Water Resources Circular No 22, 1975. 75 p, 33 fig, 3 plates, 14 tab, 36 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater resources, *Water quality, *Colorado, Water yield, Streamflow, Lakes, Reservoirs, Hydrology, Hydrologic data, Hydrogeology, Available water, Water pollution sources, Water analysis.
Identifiers: *El Paso County(Colo).

An appraisal of the water resources of northwesten El Paso County, Colo., was made as the first part of a 3-year study of the entire county. Mean annual precipitation ranges from 14 to 30 in. and is a function of altitude. The area is drained by Fountain Creek and its tributaries which have been described by means of the observed flow characteristics at 27 stream-gaging sites and the estimated flow characteristics at 14 sites. A water budget shows the average annual water inventory is about 520,000 acre-ft, of which about 92 percent is evapotranspired. An inventory of lakes and reservoirs indicates the storage capacity of one reservoir, Northfield Reservoir No. 5, is over one-half of the area's total surface-water storage capacity. The annual precipitation at Colorado Springs, the country's largest municipality, ranged between 8 and 25 in. in the last 24 years. Colorado Springs obtains about 89 percent of its total domestic water supply from surface-water sources. The water supply for Colorado Springs appears adequate until 1990 due to the reuse and transmountain importation of water. Waters from streams draining Pikes Peak are of good quality for domestic use except for concentrations of fluoride which exceed limits of drinking-water standards. Downstream from Colorado Springs the water in Fountain Creek is badly polluted due to sewage. The principal aquifers are alluvial deposits and the Dawson Formation. Calculated recharge rates range from 0 to 4 in. per year. In the principal areas of recharge to the Dawson, the dissolved-solids concentration of water in the Dawson aquifer is less than 100 mg/litre. The dissolved-solids concentration of groundwater increases downgradient to about 500 mg/litre in areas of discharge. (Woodard-USGS)
W76-09828

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-09829

A PRIMER ON FLOODPLAIN DYNAMICS,
Geological Survey, Reston, Va.
T. Maddock, Jr.
Journal of Soil and Water Conservation, Vol 31, No 2, p 44-47, March-April 1976. 2 ref.

Descriptors: *Flood plains, *Floods, *Sediment transport, *Rivers, *Environmental effects, Channel erosion, Channel morphology, Construction, Urbanization, Flow characteristics, Vegetation, Biota.
Identifiers: *Flood plain changes.

The changes in the characteristics of flood plains with changing discharges of water and sediment are described. Included are relations between the hydraulics and vegetation of stream channels. Changes in a channel will reflect the activities of man that alter the characteristic discharge of water and sediment reaching a stream. Urbanization, for example, which during construction periods generally results in increased sediment concentrations, later results in increased rates of runoff and decreased sediment production. In the first stage sediment deposition takes place. In the second stage channel widening or deepening can be expected over the length of channel required for the peak to attenuate. Below that point the newly eroded material tends to deposit. (Woodard-USGS)
W76-09831

SYMPOSIUM ON MODELING TECHNIQUES, VOLUME I.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 2A.
W76-09941

HYDROLOGIC FORECASTING FOR THE OHIO RIVER WATERWAY,
National Weather Service, Cincinnati, Ohio. River Forecast Center.
C. M. Relyea.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 43-62, 1975. 7 fig, 1 tab, 18 ref, 2 append.

Descriptors: *River forecasting, *Computer models, *Ohio River, Rivers, River systems, Streamflow forecasting, Navigation, Navigable rivers, Hydrologic data, River regulation, Flood control, Dams, Flood routing, Weather, Runoff, Hydrographs, Routing, Hydrology.

1975 may be considered the bicentennial year of substantial navigation on the Ohio River. For over a hundred years, the National Weather Service has been making weather and flood forecasts for the benefit of navigation. The shipping industry along the Ohio River and its navigable tributaries needs forecasts of stage, current velocity, ice formation, and weather conditions. Fast communications and computers now enhance the effectiveness of standard river forecast procedures. New procedures under consideration were described briefly, with particular emphasis on dynamic streamflow routing. (See also W76-09941) (Sims - ISWS)
W76-09944

SOME HARD LESSONS IN NUMERICAL HYDRAULICS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W76-09952

NUMERICAL TWO-DIMENSIONAL FLOW MODEL FOR RIVER SYSTEMS,
Waterloo Univ. (Ontario). Dept. of Systems Design.
M. Chandrashekar, L. R. Muir, and T. E. Unny.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 407-425, 1975. 8 fig, 1 tab.

Descriptors: *Model studies, *River systems, *Flow, Mathematical models, Computer models, Rivers, Streamflow, Numerical analysis, Equations, Storage, Water levels, Discharge(Water), Hydraulics.
Identifiers: *Two-dimensional flow models, *Flow models.

A two-dimensional hydrodynamic model was described that solves the non-linear Navier-Stokes equations describing the free surface flow in a river system that could include islands and branch rivers. Within the limitations imposed by storage, etc., the program was given in general form such that, with a few changes, it could be made adaptable to any river system. A form of stretched co-ordinate system has been embodied in the finite difference formulation of the problem. The solutions for heads (elevations) and velocities were obtained using the two-dimensional implicit central difference scheme so that it can be considered unconditionally stable. A numerical example was worked out. (See also W76-09941) (Sims - ISWS)
W76-09964

TWO-DIMENSIONAL MODEL OF FLOW TOWARD INTAKES,
Nuclear Regulatory Commission, Washington, D.C. Hydrologic Engineering Section.
R. B. Codell.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 426-438, 1975. 6 fig, 8 ref.

Descriptors: *Model studies, *Intakes, *Rivers, *Flow, Streamflow, Discharge(Water), Nuclear powerplants, Mathematical models, Computer models, Equations, Hydraulics.
Identifiers: *Two-dimensional flow models, Flow models.

The vertically integrated equations of mass and momentum conservation were formulated in the stream function-vorticity domain for the solution of the two dimensional (areal) flow field near shoreline water intakes. It was found that the scale of typical shoreline intake problems is such that the inertial, bottom friction, and lateral stress terms in the momentum equations cannot be neglected if reasonable answers are expected. Results were presented for a simulation of a

nuclear power plant intake on a river in the backwater of a dam, illustrating the usefulness of the techniques presented in evaluating possible entrainment of passive aquatic organisms. (See also W76-09941) (Sims - ISWS)
W76-09965

MATHEMATICAL MODEL OF FLOW IN A STREAM-AQUIFER SYSTEM,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
C. E. K. Rovey, and E. V. Richardson.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 439-457, 1975. 6 fig, 10 ref, 1 append.

Descriptors: *Model studies, *Flow, *Streams, *Aquifers, *Surface-groundwater relationships, Mathematical models, Computer models, Streamflow, Water table, Water levels, Groundwater, Seepage, Infiltration.
Identifiers: *Flow models.

A three-dimensional, finite difference model was developed for simulating flow in a groundwater-surface water system. The basis of the model was the finite difference form of Richard's equation for fully and partially saturated subsurface flow. The model was used to simulate flow in a stream-aquifer system. Effects of stream flow on groundwater movement were treated by applying the appropriate boundary conditions to Richard's equation. Contributions of groundwater to river flow were quantified by including seepage rates in the computation of river discharge. The accuracy of the model was tested by using it to simulate flow in a real stream-aquifer system, and comparing results obtained by the model to field measurements. Results obtained by the model included mean monthly streamflow values at each end of the study area for an eight-year time period, and a map of water table elevations throughout the region at the end of the run. Comparison of computed results with observed data indicated fair to good agreement. It was concluded that the model is capable of producing a reasonably accurate simulation of flow in a real stream-aquifer system. (See also W76-09941) (Sims - ISWS)
W76-09966

FORECASTS FOR THE SACREMENTO RIVER SYSTEM,
National Weather Service, Sacramento, Calif. River Forecast Center.
R. J. C. Burnash, and R. L. Ferral.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 458-465, 1975. 2 fig, 5 ref.

Descriptors: *Model studies, *Forecasting, *Rivers, *Tidal effects, River systems, Tides, Estuaries, Water levels, Navigable rivers, Flow, Streamflow, Runoff, Rainfall, Hydrology, *California.
Identifiers: *Sacramento River(Calif).

The Sacramento River Forecast Center of the National Weather Service cooperates with the State of California Department of Water Resources in providing a prediction service for river conditions in California. A principal river is the Sacramento, a navigable system in its lower reaches, which includes a major inland port facility at Sacramento. Forecasts of river levels and flow volumes along this system are produced using a series of deterministic and stochastic techniques. The structure of the forecast system includes a simulation of the contributing areas' snow accumulation and melt, a conceptual deterministic watershed runoff response model, and a variety of streamflow routing techniques. These systems process historic and real-time data, short period meteorological forecasts, and climatological records to produce deterministic and /or stochastic analyses of future conditions. The results include short period (up to one week) discrete forecasts of river conditions and long period (up to one year) forecasts of minimum tidal levels in the lower reaches for use in scheduling shipping and cargo loading. This system is currently being expanded to provide additional data for the operators of the numerous structures which control river levels. Such forecasts will assist the reservoir operations in the economic use of water as a resource as well as improving the analysis of future water levels in navigable areas. (See also W76-09941) (Sims - ISWS)
W76-09967

MATHEMATICAL MODELING OF ALLUVIAL CHANNELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-09968

MOVABLE-BED RIVER-MODELS,
Waterloopkundig Laboratorium, Delft (Netherlands).
M. de Vries, and J. J. van der Zwaard.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 484-500, 1975. 14 fig, 25 ref.

Descriptors: *Model studies, *Rivers, *Geomorphology, Mathematical models, Hydraulic models, Erosion, Sedimentation, Sediment transport, Sediments, River beds, Flow, Streamflow.

For morphological problems in rivers both physical and mathematical models are used to forecast changes in the river bed due both to natural causes and human interference. The state-of-the-art regarding this modelling was discussed mainly against the background of the research during the last decades carried out in the Delft Hydraulics Laboratory. For the two types of models the discussion focused on present capabilities, combined use, and possible future improvements. (See also W76-09941) (Sims - ISWS)
W76-09969

PHYSICAL MODELING TECHNIQUES USED IN RIVER MODELS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. River Regulation Branch.
J. E. Foster.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 540-559, 1975. 10 fig, 1 ref.

Descriptors: *Model studies, *Rivers, *Hydraulic models, Streamflow, Flow, Erosion, Sedimentation, Roughness(Hydraulic), Hydraulic design, Beds, River beds, Bottom sediments, Channel morphology, Hydrographs, Hydraulics.
Identifiers: *Fixed-bed models, *Movable-bed models, River models, Modeling techniques.

This paper reviewed the basic considerations for determining the type of model needed for a particular study, the selection of scales, the type data to be collected, the accuracy expected, and the various techniques used to simulate prototype occurrences in river models. The design, operation techniques, and results of both fixed-bed and movable-bed model studies conducted at the Waterways Experiment Station were discussed as examples of river models being used to solve actual problems. (See also W76-09941) (Sims - ISWS)
W76-09972

MODELING OF MEANDERING AND BRAIDING IN RIVERS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W76-09974

RIVER AND ESTUARY MODELING WITH THE SIVA SYSTEM,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Centre.
For primary bibliographic entry see Field 2A.
W76-09982

2F. Groundwater

MONITORING WELLS,
Oregon State Engineer's Office, Salem.
For primary bibliographic entry see Field 4B.
W76-09558

A THREE-DIMENSIONAL GALERKIN FINITE ELEMENT SOLUTION OF FLOW THROUGH MULTIAQUIFERS IN SUTTER BASIN, CALIFORNIA,
California Univ., Davis. Dept. of Water Science and Engineering.
S. K. Gupta, and K. K. Tanji.
Water Resources Research, Vol. 12, No. 2, p 155-162, April 1976. 6 fig, 1 tab, 9 ref. (Project UCAL-WRC-W438).

Descriptors: *Leakage, *Aquitards, Model studies, *Finite element analysis, *California, Aquifers, Groundwater movement, Groundwater basins, Heterogeneity, Dissolved solids, Connate water, Water quality, Digital computers, Equations, Groundwater, Data processing, Faults(Geologic), Hydraulic conductivity, Water table, Aquifer systems.
Identifiers: Multiaquifers, *Sutter Basin(Calif), Three-dimensional flow, Galerkin technique, Core storage, Processor time, Disk/tape, Leaky aquifers.

A three-dimensional finite element solution was obtained for the simultaneous consideration of multiaquifers coupled through semiconfining layers, and the model was applied to a groundwater regime in Sutter Basin, California. The use of a disk/tape in data handling and computation has reduced the core storage and processor time and increased the capability of a given computer system to simulate basins larger than are presently possible with the use of only core storage. This economy was achieved by storing on a disk/tape all the intermediate results which are needed repeatedly. On the Burroughs B6700 each steady state solution of 123 three-dimensional elements and 232 nodes was obtained with 20 kbit of memory and 1.49 min of processor time. (Visocky - ISWS)
W76-09562

THEORY OF MULTIPLE LEAKY AQUIFERS 1. THE INTEGRODIFFERENTIAL AND DIFFERENTIAL EQUATIONS FOR SMALL AND LARGE VALUES OF TIME,
Universidad Nacional Autonoma de Mexico, Mexico City. Instituto de Ingenieria.
L. Rodarte.
Water Resources Research, Vol. 12, No. 2, p 163-170, April 1976. 2 fig, 16 ref.

Descriptors: *Leakage, *Aquifers, *Aquicludes, *Aquitards, *Mathematical models, Equations, Theoretical analysis, Mathematical studies, Drawdown, Water wells, Pumping, Permeability,

Aquifer systems, Elasticity(Mechanical), Time, Artesian heads.
Identifiers: *Multiple aquifers, *Leaky aquifers, Integrodifferential equations, Piezometric surface.

The general problem of multiple leaky aquifers was analyzed by using a particular problem as a starting point. Differential and integrodifferential equations for small and large values of time, valid for the analysis of multiple leaky aquifers, were obtained. The proposed equations are appropriate for both the numerical and the analytic treatment of the regional evolution of the piezometric loads. (Visocky - ISWS)
W76-09563

NUMERICAL SIMULATION OF WASTE MOVEMENT IN STEADY GROUNDWATER FLOW SYSTEMS,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W76-09564

HYDROLOGY OF THE MADISON FORMATION AND ITS POTENTIAL USE FOR WATER SUPPLY FOR ENERGY DEVELOPMENT,
Wyoming Univ., Laramie. Water Resources Research Inst.
P. W. Huntoon.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 543, $4.00 in paper copy, $2.25 in microfiche. Completion Report, April 1976. 42 p, 5 fig, 5 tab, 18 ref. OWRT A-019-WYO(2), 14-31-0001-4051, 5051, 6053.

Descriptors: Aquifers, *Aquifer characteristics, *Groundwater, *Recharge, Hydrology, *Wyoming, *Hydrogeology, Water supply, Energy.
Identifiers: Madison formation(Wyo), Madison aquifer(Wyo), Bighorn Mountains(Wyo), Powder River Basin(Wyo).

Precipitation on the Bighorn Mountains in Wyoming provides approximately 400,000 ac ft/yr of recharge water to the Madison aquifer in the Powder River Basin. The Madison aquifer is herein defined to include the Paleozoic Bighorn Dolomite, Jefferson Dolomite, Madison Limestone, Amsden Formation, and Tensleep Sandstone. Recharge takes place through outcrops primarily along fractures such as joints, parting along bedding, and secondary fractures associated with faults and folds. The fractures along faults and folds produce zones of large secondary permeability that parallel the trends of the structures. These zones are important in the recharge process only where they trend from the flanks of the Bighorn range into the Powder River Basin. Movement of water through a paleokarst developed in the upper part of the Madison Limestone or through geologically young caves is negligible. The average annual recharge to the Madison aquifer along the 145 mi of outcrop examined in Wyoming is 2,800 ac ft/mi. About 30% of this takes place through zones of secondary permeability associated with tectonic structures. Each structure accounts for an average of 8,600 ac ft/yr of recharge. Approximately 180,000 ac ft/yr enters the Madison Limestone based on the thickness of the Madison Limestone compared to the total thickness of the Madison aquifer.
W76-09757

GRAVITY GEOPHYSICS FOR GROUNDWATER EXPLORATION IN GLACIATED AREAS,
Michigan State University, East Lansing. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W76-09758

COMPUTER ESTIMATES OF NATURAL RECHARGE FROM SOIL MOISTURE DATA - HIGH PLAINS OF COLORADO,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R. A. Longenbaugh, and N. Krishnamurthi.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 661, $4.50 in paper copy, $2.25 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No. 64, August 1975. 58 p, 13 fig, 1 tab, 33 ref. OWRT A-016-COLO(1).

Descriptors: *Natural recharge, Estimating, *Soil moisture, Soil water, *Groundwater recharge, *Mathematical models, Model studies, *Colorado, Soil physical properties, *Great Plains, Water table.
Identifiers: *Computer Estimates, Finite-difference solution, Soil moisture data, Newton-like method, Transient soil moisture.

The research has shown that transient soil moisture data observed at vertical positions at one station can be used as descriptors of natural groundwater recharge to evaluate its time distribution at that station. Hydraulic properties of the soil and initial and boundary conditions must be known before applying the mathematical model developed in this study to other locations. The model assumed that the moisture content of unsaturated soil below the zone of influence of evapotranspiration varies in the linear range of the soil water characteristic curve. The parameters of the model characterize the hydraulic properties of the soil and their spatial variability. They were estimated by a linear statistical model. The mathematical model was solved by a Finite-Difference technique adopting the Crank-Nicholson scheme. The model was verified with an analytical solution and the agreement for the case of homogeneous soil was very good. Field data collected during a drainage cycle were used to verify the model for non-homogeneous soil. The verification was also satisfactory in the latter case. The model was then applied to estimate recharge rates from data collected by the USGS and ARS at the Great Plains Field Experiment Station near Akron, Colorado. Estimated monthly recharge rates varied from a low of 0.02 inches to a high of 1.42 inches. Comparison of the Akron recharge estimates with other data indicates the values were acceptable. An average annual recharge of 4 inches was computed for the Akron site. This result was compatible with the observed rise of 3 feet in the local water table during the same time period.
W76-09761

ROLE OF CARBONATE ROCKS IN MODIFYING FLOOD FLOW BEHAVIOR,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 2A.
W76-09784

THE CRITICAL DEPTH OF THE LEVEL OF SOIL-SALINIZING GROUND WATERS, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W76-09808

RECONNAISSANCE MAP SHOWING RELATIVE AMOUNTS OF SOIL AND BEDROCK IN THE MOUNTAINOUS PART OF THE MORRISON-EVERGREEN QUADRANGLES AND ADJOINING AREAS TO THE WEST IN JEFFERSON COUNTY, COLORADO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-09825

REPORT OF WATER LEVELS IN SELECTED OBSERVATION WELLS IN UTAH--APRIL 1976,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W76-09832

OPERATION AND MAINTENANCE OF A DEEP-WELL WATER-LEVEL MEASUREMENT DEVICE, 'THE IRON HORSE',
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-09835

GEOCHEMICAL AND ISOTOPIC ANALYSES OF WATERS ASSOCIATED WITH THE EDWARDS LIMESTONE AQUIFER, CENTRAL TEXAS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W76-09836

A PROPOSED ALGORITHM FOR THE SOLUTION OF THE LARGE-SCALE INVERSE PROBLEM IN GROUNDWATER,
California Univ., Los Angeles. Dept. of Engineering Systems.
S. Chang, and W. W-G. Yeh.
Water Resources Research, Vol. 12, No. 3, p 365-374, June 1976. 4 fig, 7 tab, 23 ref. (California Water Resources Center project W290).

Descriptors: *Algorithms, *Groundwater, Flow, *Mathematical models, Constraints, Equations, Least squares method, Systems analysis, *Model studies, *Base flow.
Identifiers: Parameter identification, Quadratic programming.

A new algorithm is introduced for the solution of the problem of parameter identification associated with a two-dimensional unsteady state groundwater flow. The parameters to be identified are functions of the space variables. It is assumed that some observations on the dependent variable of the governing equation are available. The unknown parameters are directly identified from observations. An implicit finite difference scheme is used to approximate the original partial differential equation. A least squares criterion function is employed. The identification problem is then formulated as a standard quadratic programming representation by quasi-linearization. The formulation is further modified by a simple matrix operation which drastically reduces the dimension of the constraint set. The new algorithm is shown to be very effective in solving the large-scale inverse problem, and it is easily implemented, rapidly convergent, and able to handle any inequality constraints, a feature that is essential for such a problem. (Bell-Cornell)
W76-09850

MATHEMATICAL MODEL OF FLOW IN A STREAM-AQUIFER SYSTEM,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-09966

NUCLEAR TECHNIQUES IN HYDROLOGICAL STUDIES,
Uppsala Univ. (Sweden). Dept. of Hydrology; and Uppsala Univ. (Sweden). Dept. of Physical Geography.
E. Eriksson.
Indian Soc Nuclear Tech Agric Biol Newsl. 2(2), p 51-54, 1973.

Descriptors: *Groundwater movement, Water supply, Water sources, Asia, Groundwater recharge, Root zone.
Identifiers: *Nuclear techniques(Hydrology), *India.

Nuclear methods for evaluating ground water supplies, movement of ground water, root zone water, recharge rate and origin of ground water are

discussed and applied to water problems in India.--Copyright 1974, Biological Abstracts, Inc.
W76-09996

2G. Water In Soils

EFFECT OF DIFFERENT SPRING SOIL MOISTURE LEVELS ON MOISTURE STRESS,
National Weather Service, Cincinnati, Ohio. River Forecast Center.
For primary bibliographic entry see Field 3F.
W76-09412

WATERSHED RESPONSE TO PARTIAL AREA APPLICATIONS OF SIMULATED RAINFALL,
Northeastern Forest Experiment Station, Pennington, N. J.
For primary bibliographic entry see Field 2A.
W76-09467

EFFECT OF THINNING ON THE FOLIAGE AND FOREST FLOOR PROPERTIES OF PONDEROSA PINE STANDS,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 4A.
W76-09474

WATER CONSERVATION IN ARID-ZONE SOILS,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
For primary bibliographic entry see Field 3B.
W76-09478

WATER UTILIZATION AND SOIL SALINITY: CONTROL IN ARID ZONE AGRICULTURE,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
For primary bibliographic entry see Field 3C.
W76-09482

REDOX POTENTIAL IN IRRIGATED DESERT SOILS AS AN INDICATOR OF AERATION STATUS,
Imperial Valley Conservation Research Center, Brawley, California.
B. D. Meek, and L. B. Grass.
Soil Science Society of America Proceedings, Vol. 39, No. 5, p 870-875, Sept-Oct, 1975. 10 fig, 2 tab, 15 ref.

Descriptors: *Oxidation-reduction potential, *Irrigation effects, *Soil-water-plant relationships, *Sierozems, Sprinkler irrigation, Flood irrigation, Soil moisture, Soil microorganisms, Arid lands, Environmental effects, Soil temperature, Soil tests, Aeration.
Identifiers: Drip irrigation, Oxygen diffusion rate.

Six experiments were designed to evaluate the effects of temperature, flooding time, soil water content, and energy source on the redox potential (Eh) of irrigated desert soils. Field heterogeneity required the use of 10 to 20 electrodes placed in a 30-cm square to characterize a treatment. Eh varied over a short distance, with no effects due to poisoning or erratic electrode readings; a 5 C temperature increase at the 15-cm depth caused a 50-mV drop in redox potential. Soil saturation time correlated directly with Eh decline; Eh decreased less during drip or sprinkler irrigation than when soil was flooded. To lower Eh, soil moisture must be increased beyond a critical value to seal the surface to atmospheric oxygen. Measurement of the oxygen diffusion rate and quantities of iron or manganese in the soil solution will aid determination of the soil's aeration status. (Jahns-Arizona)
W76-09488

A QUANTITATIVE ANALYSIS OF THE FACTORS AFFECTING PLANT NUTRIENT UPTAKE FROM SOME SOILS,
University of Oxford, Oxford, England, Soil Science Laboratory.
J. P. Baldwin.
Journal of Soil Science, Vol. 26, No. 3, p 195-206, Sept., 1975. 3 fig, 22 ref.

Descriptors: *Nutrients, *Soil moisture, *Root systems, *Plant growth, *Soil-water-plant relationships, Soil analysis, Nutrient requirements, *Absorption, Soil structure, Potassium, Phosphates, Nitrates, Fertilizers.
Identifiers: *Nutrient uptake, Nutrient diffusion.

A model is discussed for a growing root system's absorption of nitrate, phosphate and potassium in soils supporting grasses and arable crops. The main determinants in nutrient supply are its total diffusible quantity, the rate at which the nutrient can move and the distance it must travel to a root surface. Diffusion coefficients for potassium and phosphate are often low, with mass flow adding little to the supply; a well-developed root system is required for adequate exploitation of soil reserves. Nitrate, however, moves easily to roots, either by diffusion or mass flow and the entire rooting volume is depleted fairly rapidly. These findings suggest that crop performance in a particular soil is influenced by individual root system morphologies. Soil structure and moisture regimes are crucial in determining the hospitality of a soil to plant roots. These factors deserve equal attention with chemical composition of the soil when formulating fertilizer recommendations. (Jahns-Arizona)
W76-09489

STABILITY ANALYSIS OF INFILTRATION,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia), Div. of Environmental Mechanics.
J. R. Philip.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1042-1049, November-December 1975. 1 tab, 21 ref, 1 append.

Descriptors: *Infiltration, *Stability, Mathematical studies, *Equations, *Seepage, Gravitational water, Infiltration rates, Movement, Percolation, Ponding, Soil moisture, Soil water movement, Unsaturated flows, Laboratory tests, Hydrodynamics, Model studies, Water pressure, Soils.
Identifiers: *Wetting fronts, *Nonswelling soils, *Stability analysis, Delta-function model.

A rigorous hydrodynamic stability analysis of the delta-function model of infiltration was developed. Raats recently proposed as the criterion for instability that wetting front velocity should increase with front penetration. This detailed analysis, on the other hand, showed that the fundamental criterion is that the water pressure gradient immediately behind the front should oppose the flow. The two criteria agree only in the special case where five significant parameters of the system are all constant and independent of depth, or of depth to the front. The Raats criterion fails in the various more general cases with one or more of these quantities variable. Care should be exercised in applying results for the delta-function model to flows with gradual wetting fronts, especially when nonwetting strata are involved. (Prickett-ISWS)
W76-09588

NITROGEN IN THE SUBSURFACE ENVIRONMENT,
East Central Oklahoma State Univ., Ada. School of Environmental Science.
For primary bibliographic entry see Field 5B.
W76-09662

UPWARD WATER MOVEMENT IN FIELD CORES,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-09726

COMPUTER ESTIMATES OF NATURAL RECHARGE FROM SOIL MOISTURE DATA - HIGH PLAINS OF COLORADO,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W76-09761

TRANSFORMATION OF CONCENTRATED AND COMPLEX PHOSPHORUS FERTILIZERS IN MODOW-BOG SOIL WITH A HIGH MOISTURE CONTENT, (IN AZERBAIJANI),
For primary bibliographic entry see Field 5B.
W76-09786

THE LEACHING BEHAVIOR OF DIFFERENT NITROGEN SOURCES IN LYSIMETER EXPERIMENTS, (IN GERMAN),
Badische Anilin- und Soda-Fabrik A. G., Ludwigshafen am Rhein (West Germany). Landwirtschaftliche Versuchsstation.
J. Jung, and J. Dressel.
Z Acker-Pflanzenbau. 140(1), p 1-10, 1974.

Descriptors: *Leaching, *Fertilizers, *Lysimeters, *Nitrogen, Instrumentation, *Percolation, Soils, Crop response, Nutrients, Cover crops, *Cereal crops.

Nitrogen losses from percolation were mainly due to the amount and distribution of rainfall. The extent of leaching during the 6 summer months was affected by the crop cover. The amount of rainfall had considerable influence on N leaching when there was no winter crop (6 winter months) or when rainfall exceeded the water requirements of the plants and the water capacity of the soil. Leaching of the slow-release N fertilizers was dependent to a large degree on crop rotation. Reduced leaching was ascertained for plants with a long vegetation period. Where this condition was not present, the leaching losses were greater than those for mineral fertilizers. With a vegetable/root crop rotation the slightly soluble N forms, as a result of initially low nutrient needs and the relatively long growth period of the cultivated plants, produced a superior yield to that of the normal N fertilizers due to lower leaching losses. Conversely, with the addition of slightly soluble N to the root crop/cereal rotations the yield was markedly lower. This was probably due to the deviation in the N requirement curve of cereal and the 'dosed' release of slightly soluble N. With mineral N and slightly soluble N the leaching losses were higher from fall than from spring fertilization. This can be mainly attributed to the relatively mild winter conditions at the trial site.--Copyright 1975, Biological Abstracts, Inc.
W76-09793

THE WATER SUPPLY SYSTEM OF SOIL AND NITROGEN LOSS WITH RUNOFF WATERS IN NONCHERNOZEM AREAS, (IN RUSSIAN),
Moskovskaya Selskokhozyaistvennaya Akademiya (USSR).
I. S. Shatilov, A. G. Zamaraev, and G. V. Chapovskaya.
Dokl Vses (Ordena Lenina) Akad S-Kh Nauk Im V I Lenina. 11, p 5-7, 1974.

Descriptors: Water supply, *Nitrogen, Runoff, Soils, Rainfall, *Soil moisture, Snowmelt, *Fertilization, Crop production, Wheat.
Identifiers: Nonchernozem soils.

The water supply of soil is ensured by fall rainfall and soil moisture transfer during winter to the freezing zone. Winter precipitation as melted water is accumulated in fields with a deviation of 0.008-0.015. N loss in water during (NH4)2NO3 administration by snow is more than half of the

amount administered, almost 1/3 in early spring fertilization of winter crops. Thus N fertilization of winter crops is essential for ensuring the increase in yield. The studies were made in Moscow and Leningrad, USSR.--Copyright 1975, Biological Abstracts, Inc.
W76-09794

EFFECT OF AN ELECTRIC CURRENT ON WATER STABILITY OF THE STRUCTURE OF SALINIZED SOLONETZ, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
P. K. Roy.
Biol Nauki. 17(12), p 113-117, 1974.

Descriptors: *Saline soils, Saline water, Soil structure, *Soil aggregates, *Electric currents, *Permeability, *Soil stability, Soil horizons.
Identifiers: *Salonetz soils.

The passage of an electric current through salinized solonetz during its flushing increased the content of water-stable aggregates. Under the effect of the current the impervious lower gypsum-bearing horizons became permeable.--Copyright 1975, Biological Abstracts, Inc.
W76-09804

METHOD OF EVALUATING THE EFFECTIVENESS OF TECHNIQUES FOR INCREASING THE RESISTANCE OF SOILS TO EROSION, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
For primary bibliographic entry see Field 4D.
W76-09805

THE CRITICAL DEPTH OF THE LEVEL OF SOIL-SALINIZING GROUND WATERS, (IN RUSSIAN),
V. I. Chkhikvishvili.
Soobshch Akad Nauk Gruz SSR. 77(1), p 153-156, 1975.

Descriptors: *Leaching, *Salts, *Soil horizons, Groundwater, Mineral water, Irrigation, Drainage, *Saline soils, Depth.
Identifiers: *USSR(Georgia).

In the poorly drained plains and drainless depressions of the irrigated zone of Georgia USSR, considerable quantities of salts are leached annually into the soil horizons by mineralized ground waters lying at depths of 1.6-2.5 m.--Copyright 1975, Biological Abstracts, Inc.
W76-09808

RECONNAISSANCE MAP SHOWING RELATIVE AMOUNTS OF SOIL AND BEDROCK IN THE MOUNTAINOUS PART OF THE MORRISON-EVERGREEN QUADRANGLES AND ADJOINING AREAS TO THE WEST IN JEFFERSON COUNTY, COLORADO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-09825

METHOD AND COMPOSITION FOR PREVENTING WATER CONTAMINATED WITH INDUSTRIAL WASTE FROM SEEPING THROUGH SOIL CONTAINING SAID WATER,
American Colloid Co., Skokie, Ill. (Assignee).
For primary bibliographic entry see Field 5G.
W76-09858

THE MODIFIED FERNOW FROST GAGE,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 7B.
W76-09880

VOLUME CHANGES IN SWELLING CLAYS,
Calif. State Coll., Rohnert Park.
G. Sposito.
Soil Sci. 115(4), p 315-320, 1973.

Descriptors: *Clays, Thermodynamics, Compressibility, *Montmorillonite, Sodium, *Soils, Absorption.
Identifiers: *Swelling clays.

A thermodynamic description of swelling by a clay-water-air system is presented. This description, at constant temperature, is identical with the mechanical theory of swelling developed by Philip. A new relationship is derived which shows the connection between the shrinkage curve, the load line, the swelling pressure and the compressibility of a clay at any water content. This relation is applied to the pressure-chamber data of Anderson and Low to compute the partial density of water adsorbed by Na-montmorillonite.--Copyright 1974, Biological Abstracts, Inc.
W76-09881

EVAPORATION FROM HIGHLY SALINE SOILS IN AN EXPERIMENTAL PLOT IN THE TURKMEN SSR, (IN RUSSIAN),
For primary bibliographic entry see Field 2D.
W76-09887

THE QUALITATIVE ORGANIC MATTER COMPOSITION OF SOME MARSHY SOILS OF NIZHNEVELIKORETSK PLAIN, (IN RUSSIAN),
Leningrad State Univ. (USSR).
N. N. Matinyan, and A. Yu. Pertsovich.
Vestn Leningr Univ Ser Biol. 1, p 129-134, 1974.

Descriptors: *Organic matter, *Bogs, Marshes, Soils, Drainage, Soil horizons, Cultivation, Plains, Acids, *Fulvic acids.
Identifiers: *USSR(Nizhnevelikoretsk plain).

The qualitative organic matter composition of heavy textured marshy (bog) soils and the influence of a drainage were studied. An increase of the degree of bogginess is accompanied by an accumulation of organic matter in the A1 horizon at the expense of the most mobile fractions. Drainage and cultivation lower the general quantity of the organic matter and decrease of fulvic acids.--Copyright 1975, Biological Abstracts, Inc.
W76-09888

EFFECT OF EXCESS SOIL MOISTURE ON THE CONTENT OF PHOSPHORUS COMPOUNDS IN BARLEY, (IN RUSSIAN),
Leningrad State Pedagogical Inst. (USSR). Dept. of Botany.
For primary bibliographic entry see Field 3F.
W76-09913

INVESTIGATIONS ON THE ERODIBILITY OF A DEEPLY PLOWED GRAY-BROWN PODZOLIC SOIL FROM LOESS ON A SLOPE BY MEANS OF SIMULATED RAIN, (IN GERMAN),
Niedersaechsisches Landesamt fuer Bodenforschung, Hanover (West Germany).
For primary bibliographic entry see Field 2J.
W76-09917

COMPARATIVE STUDY IN MEASURING FLUID SURFACE TENSION AND FLUID CONTENT WITH THE AID OF ELECTRICAL RESISTANCE ELEMENTS 'IN SITU' AND IN THE LABORATORY, (IN FLEMISH),
H. Verplancke, R. Hartmann, and M. De Boodt.
Meded Fac Landbouwwet Rijksuniv Gent. 38(1), p 51-66, 1973.

Descriptors: *Moisture tension, Measurement, *Surface tension, *Soil moisture, *Electrical resistance, Calibration.

The moisture tension or suction of a soil 'in situ' can be measured with electrical resistance units. Calibration curves, expressing the electrical resistance in terms of soil moisture tension, can be made as well in the laboratory as in the soil 'in situ.' A study was made of the accuracy of 3 calibration procedures, i.e., the 'in situ calibration' and 2 laboratory ones, respectively on undisturbed and disturbed soil samples. The laboratory calibration procedure on undisturbed soil samples proved best. Here the use for suction measurements only is recommended. Hysteresis phenomena complicate the calibration and so the units should not be used for moisture content measurements.--Copyright 1974, Biological Abstracts, Inc.
W76-09923

STEADY-STATE METHOD OF MEASURING UNSATURATED HYDRAULIC CONDUCTIVITY,
Battelle Pacific Northwest Labs., Richland, Wash. Water and Land Resource Dept.
J. J. C. Hsieh, and C. G. Enfield.
Commun Soil Sci Plant Anal. 5(2), p 123-129, 1974.

Descriptors: *Hydraulic conductivity, Measurement, Soil water, Moisture content, Soil moisture, Unsaturated flow.
Identifiers: Steady state method.

The technique is simple to perform as a routine operation, and the hydraulic conductivity for the entire field moisture range can be determined from a single experiment. By controlling the water potential at the porous plate bottom of an open soil container and controlling the rate of evaporation from the soil surface, a steady-state or constant water flux through the soil column was obtained. Several temperature compensated soil psychrometers were used to measure the potential gradient of the water in the soil column. The water flux was measured using a calibrated water supply. The steady-state hydraulic conductivity can be determined as a function of water potential.--Copyright 1974, Biological Abstracts, Inc.
W76-09924

THE SOFTENING OF THE KANTO VOLCANIC ASH SOIL, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Agricultural Engineering.
M. Komamura, and H. Takenaka.
J Agric Sci Tokyo Nogyo Daigaku. 17(4), p 331-341, 1973.

Descriptors: *Soil moisture, Asia, Testing procedures, Soil compaction.
Identifiers: *Soil softening, *Japan(Kanto volcanic ash soil).

The softening of the soils is an important problem in earth work. Relationships between softening of the Kanto volcanic ash soil (Japan) and change of suction of soil moisture (pF) were studied. Cone penetration, unconfined compression, triaxial compression and pF of the soil water were measured. The degree of softening is different in each soil layer. The relationship between pF and the cohesion of soil is log10C = pF. Softening index (S) defined by pF value is useful to judge the degree of softening.--Copyright 1974, Biological Abstracts, Inc.
W76-09925

EFFECT OF WATER QUALITY AND MANAGEMENT PRACTICES ON SOME CHEMICAL PROPERTIES OF SOILS,
West Pakistan Agricultural Univ., Lyallpur. Dept. of Soil Sciences.
For primary bibliographic entry see Field 3C.
W76-09926

DEPENDENCE OF PASTURE GRASS YIELD ON SOIL MOISTURE LEVEL, (IN RUSSIAN),
Moskovskaya Selskokhozyaistvennaya Akademiya (USSR).
For primary bibliographic entry see Field 4A.
W76-09930

TOTAL POROSITY AND PORE SIZE DISTRIBUTION IN UNTILLED AND TILLED LOESS SOILS, (IN GERMAN),
Goettingen Univ. (West Germany). Institut fuer Pflanzenbau und Pflanzenzuechtung.
W. Ehlers.
Z Pflanzenernaehr Bodenkd. 134(3), p 193-207, 1973.

Descriptors: *Loess, Soils, *Podzols, *Porosity, Seasonal, Cultivation, Tillage.

Soil samples were collected from a 2-6 cm depth of a gray brown podzolic soil (Typudalf) derived from loess. Total porosity differed in untilled and tilled plots on the average by 4.7 vol. %. The seasonal changes were pronounced on tilled soil. Values of total porosity were higher during spring and fall than during summer. Values were influenced by soil cultivation, rainfall and green manure crops. The changes of the fraction of large pores (>30 microns), expressed on a volume basis, were similar to the changes in total porosity in direction but greater in extent. The seasonal changes of the fractions of medium pores (3-30 microns), small pores (0.2-3.0 microns) and very small pores (<0.2 microns) were apparently independent of the changes in total porosity. Compacting and loosening the soil affected mainly the amount of large pores. The seasonal changes of soil water content in the field influenced pore size distribution. With constant total porosity, increasing water content induced pore size redistribution in favor of the pores >300 microns and 1.5-3.0 microns. A decrease in total porosity did not induce an increase in homogeneity. The average total porosity of the untilled and tilled soil was near the lower and upper limits, respectively, of the range, which was considered to be the optimum for air capacity.--Copyright 1975, Biological Abstracts, Inc.
W76-09939

STUDIES ON THE RELATIONSHIPS BETWEEN MOISTURE AND SUCTION IN SOME SOILS OF THE TISA PLAIN, (IN RUMANIAN),
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
S. Balan.
An Inst Stud Cercet Pedol. 40, p 31-43, 1972(1974).

Descriptors: *Soil moisture, Moisture content, *Chernozems, Europe, Soil texture, Distribution, Grains.
Identifiers: *Romania(Tis Plain), Suction.

In finely textured wet meadow soils, the interaction phenomena between water and colloidal soil particles are more intense than in meadow chernozems, carbonate meadow chernozems, leached chernozems and other medium-textured soils of the Tisa Plain (Romania). The interactions between water and soil particles are closely correlated to texture and mineralogical composition. The medium-textured chernozems of the Western Plain, influenced or not by ground water, have a water-holding capacity corresponding to a suction of 1/3 atm; in heavy soils having a very fine grain size distribution (>80% clay below 2 microns) it ranges 2/3-1 atm. Highly significant correlations exist between the nature and content of the clay fraction <2 microns in size, the cation exchange capacity, the hygroscopicity coefficient, the specific surface and the humidity corresponding to suctions of 15, 8, 4 and 1 atm.--Copyright 1975, Biological Abstracts, Inc.
W76-10000

2H. Lakes

CHARACTERISTICS OF COASTAL CIRCULATION AFFECTING THE TRANSPORT AND DISPERSION OF MATERIAL RELEASED FROM THE NUCLEAR INDUSTRY,
Energy and Research and Development Administration, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-09504

HYDROLOGIC AND CHEMICAL ANALYSIS OF THE PRINCIPAL PIEDMONTESE TRIBUTARIES OF LAGO MAGGIORE IN RELATION TO ITS TROPHIC MODIFICATIONS, (IN ITALIAN),
For primary bibliographic entry see Field 5C.
W76-09576

PHOSPHORUS AND NITROGEN CYCLE ON A TRANSECT IN LAKE ONTARIO DURING THE INTERNATIONAL FIELD YEAR 1972-1973 (IFYGL),
Canada Centre for Inland Waters, Burlington (Ontario). Applied Limnology and Physical Processes Section.
For primary bibliographic entry see Field 5C.
W76-09594

PHYTOPLANKTON OF THE SALINE WATERS OF KANEM (CHAD): X. CONCLUSIONS, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Dept. of Hydrobiology.
A. Iltis.
Cah O R S T O M Ser Hydrobiol. 9(1), p 13-17, 1975.

Descriptors: Phytoplankton, Saline water, Ponds, Cyanophyta, Africa, Aquatic algae, Biomass, Salinity, Lakes.
Identifiers: *Lake Chad(Chad).

The algal flora of saline waters of Kanem near Lake Chad does not have a pronounced tropical character. Cyanophyta generally compose the major part of the phytoplanktonic biomass. A positive correlation exists between algal density and salinity. Specific diversity and Motomura's constant decrease in relation to the increase in salinity. According to the salinity and the biological characteristics, 3 biological zones may be defined among the permanent lakes. In the temporary ponds, algal populations evolve rapidly and continually. (See also W75-06778, W73-13796)--Copyright 1976, Biological Abstracts, Inc.
W76-09596

ON LONG-TERM STABILITY OF ZOOPLANKTON COMPOSITION,
Uppsala Univ. (Sweden). Inst. of Limnology.
For primary bibliographic entry see Field 5C.
W76-09600

AN UNDERWATER TEMPERATURE-DEPTH DATA COLLECTION DEVICE,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
D. N. Baumgartner.
Special Report No. 26, February 1976. 30 p, 15 fig, 1 tab, 4 ref, 3 append.

Descriptors: *Pressure measuring instruments, *Lake Michigan, *Great Lakes, *Water temperature, *Water pressure, *Instrumentation, Underwater, Data collections, Remote sensing, Electrical equipment, Physical properties, Electricity, Electrical engineering, Properties, Thermal properties, Water properties, Surface waters, Depth.
Identifiers: *Temperature-depth probe(Underwater), Signal transmission, Submerged probe, Data demodulation, Tape recorder, Probe circuit, Probe housing.

An underwater probe has been constructed which, when towed by a vessel, transmits temperature and pressure (depth) information to a receiver and recorder on deck. A carrier signal, which is frequency modulated by temperature and pressure, is sent up the towing cable which also is used to conduct power to the probe. The ondeck receiver records the modulated carrier signal on a low-cost cassette tape recorder. The temperature and pressure information are demodulated and can be monitored or recorded as voltage analog outputs. (Henley-ISWS)
W76-09727

CHANGES IN THE SEDIMENTATION CHARACTERISTICS OF AN URBANIZING WATERSHED, DALLAS AND COLLIN COUNTIES, TEXAS,
Texas Dept. of Community Affairs, Austin.
For primary bibliographic entry see Field 4C.
W76-09745

MATERIALS BUDGETS OF LAKE CHAMPLAIN,
Vermont Univ., Burlington. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W76-09756

SEDIMENTATION RATES AND SEDIMENT THICKNESS IN LAKE CHAMPLAIN,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2J.
W76-09759

SEDIMENT PROPERTIES, LAKE CHAMPLAIN: 1971-1975,
Vermont Univ., Burlington. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-09763

VERIFICATION OF NUMERICAL MODELS OF LAKE ONTARIO, III. LONGTERM HEAT TRANSPORTS,
Canada Centre for Inland Waters, Burlington (Ontario).
T. J. Simons.
Journal of Physical Oceanography, Vol. 6, No. 3, p 372-378, May 1976. 5 fig, 11 ref.

Descriptors: *Heat transfer, *Model studies, *Lake Ontario, *Great Lakes, Circulation, Water circulation, Mixing, Mathematical models, Heat, Temperature, Water temperature, Lakes, Limnology.
Identifiers: Model verification.

Numerical computations of water circulations, combined with observed temperature distributions, permit estimates of heat transports in Lake Ontario throughout the 1972 International Field Year. Weekly estimates of heat budgets and surface fluxes are available from ship surveys and meteorological observations, thus allowing for validation of model results. Whereas the hydrodynamic model employs a grid mesh of 5 km, the present verification study was based on 21 lake zones, with the mean depth contour separating shore zones from mid-lake areas. Agreement between simulations and observations ranged from satisfactory to poor, as a function of both time and space. The model was found to perform best along the north shore and in the fall season. Analysis of the results points at low model resolution and gaps in the observational network as the major causes of failure to reproduce south shore heat transports. Persistent overestimates of heat advection by vertical circulations were ascribed to the present structure of the hydrodynamic model. A brief discussion was included of the present heat

transport calculations in the context of estimating vertical mixing properties for different lake zones. (See also W75-01987 and W75-07462) (Sims - ISWS)
W76-09783

SEDIMENTATION AND PHOSPHORUS BALANCE IN LAKE LUCERNE (HORW BAY) AND IN THE ROTSEE, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5C.
W76-09790

ROTIFER PRODUCTION IN LAKE BAIKAL, (IN RUSSIAN),
Biologo-Geograficheskii Nauchno-Issledovatelskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 5C.
W76-09791

THE ALGAL POPULATION OF DUEMMER LAKE IN THE YEARS 1970/71, (IN GERMAN),
Niedersaechsische Landesinstitut Marschen und Wurtenforsch., Wilhelmshaven (West Germany).
For primary bibliographic entry see Field 5C.
W76-09812

IRON-MANGANESE MICROORGANISMS STUDIED BY OVERGROWING TECHNIQUE, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institute of Lakes Keeping.
For primary bibliographic entry see Field 5A.
W76-09813

CHARACTERISTICS OF THIONIC BACTERIA FROM THE LAKES OF THE MARI ASSR, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W76-09814

THE ROLE OF MICROFLORA IN THE PRODUCTIVITY OF A SALMON BREEDING LAKE, (IN RUSSIAN),
Akademiya Nauk SSSR, Borok. Inst. of Biology Inland Waters.
For primary bibliographic entry see Field 5C.
W76-09818

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1974,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-09829

CALCULATION OF WATER TEMPERATURES IN CLEAR LAKE, IOWA,
Ichthyol. Assoc., Berwick, Pa. Icthyological Associates, Inc., Berwick, Pa.
For primary bibliographic entry see Field 5B.
W76-09879

FEEDING HABITS OF THE POPULATION OF WHITEFISH (COREGONUS LAVARETUS (L.)) IN HAUGATJERN: A EUTROPHIC NORWEGIAN LAKE,
Tromsoe Museum (Norway). Dept. of Norway.
O. J. Jacobsen.
Norw J Zool. 22(4), p 295-318, 1974.

Descriptors: Eutrophication, Lakes, Daphnia, *Fish diets, Seasonal, *Fish food organisms, Spawning, Zooplankton.
Identifiers: Coregonus-Lavaretus, Cyclops, *Whitefish, *Fish feeding habits, *Norway(Haugatjern Lake).

Mature whitefish from Lake Haugatjern, probably the most productive Norwegian fishing water, fed most intensively during and just after the spring turnover; the females increased their food uptake just after the spawning season also. The variations in feeding intensity were probably due to hydrographical and physiological factors. Immature fish fed more intensively than older fish, but not with such regular fluctuations as the mature fish. In the summer the mature fish fed mostly on zooplankton and during the rest of the yr on bottom food; zooplankton food always dominated in 0-2 yr old whitefish. Daphnia was selected by all whitefish groups and was the most important plankton item; Cyclops was avoided.
W76-09882

THE VEGETATION OF THE 'LUKNIANY LAKE' NATURE RESERVE IN THE MAZURIAN LAKE DISTRICT,(IN POLISH),
Akademia Rolniczo-Techniczna, Olsztyn-Kortowo (Poland). Inst. of Plant Biology.
For primary bibliographic entry see Field 5C.
W76-09990

PRIMARY PRODUCTION IN THE FROZEN LAKE BALATON,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 5C.
W76-09991

THE PRIMARY PRODUCTION OF PHYTOPLANKTON IN LAKE BALATON APRIL-SEPTEMBER 1972,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 5C.
W76-09992

2I. Water In Plants

COMPARATIVE EVALUATION OF FOOD PLANTS OF THE ARARAT COCHINEAL SCALE (PORPHYROPHORA HAMELII) (IN RUSSIAN),
Akademiya Nauk Armyanskoi SSR, Erevan. Institut Zoology.
A. A. Sevumyan, S. M. Sarkisyan, R. N. Sarkisov, and R. A. Galstyan.
Biol Zh Arm 27(11); p 96-98, 1974.

Descriptors: *Grasses, *Microorganisms, Parasitism.
Identifiers: Aeluropus-Litoralis, Ararat, Cochineal scale, *Food plants, Phragmites, Australis, Porphyrophora-Hamelii, *Scale, Shore grass, *Reeds.

Information is given on the comparative value of food plants, the shore grass Aeluropus littoralis and the reed Phragmites austrais, of the Ararat cochineal scale, obtained on the basis of the degree of infestation by the scale under natural conditions and by a comparison of the weight, length, width and fecundity of female scales on these plants. The reed is a second food plant for the scale, the primary plant being the shore grass.-Copyright 1975, Biological Abstracts, Inc.
W76-09406

EFFECT OF THINNING ON THE FOLIAGE AND FOREST FLOOR PROPERTIES OF PONDEROSA PINE STANDS,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 4A.
W76-09474

DROUGHT ADAPTATIONS IN TWO CALIFORNIAN EVERGREEN SCLEROPHYLLS,
Australian National Univ., Canberra. Dept. of Environmental Biology; and Australian National Univ., Canberra. Research School of Biological Sciences.
P. A. Morrow, and H. A. Mooney.
Oecologia (Berl). 15(3), p 205-222, 1974.

Descriptors: California, *Evergreens, *Water stress, *Drought resistence, Plant morphology, Plant physiology.
Identifiers: Arbutus-Menziesii, Heteromeles-Arbutifolia, *Sclerophylls.

A field study was initiated to determine the patterns of water stress imposition and stomatal resistance to gas exchange in representative species of 2 evergreen sclerophyllous communities in California. In concurrent experiments, plant water potential, temperature and vapor pressure gradient were varied to determine the relative importance of morphological and physiological parameters in delaying onset of water stress during drought periods. In general, stomatal and photosynthetic responses to water stress were similar in both species. Both were able to fix C even when leaf water potentials dropped as low as -25 bars. Stomatal movements were positively correlated with soil water potential rather than to leaf water potential. Water stress developed much more rapidly in Arbutus menziesii, a plant of more northerly distribution, than in Heteromeles arbutifolia where they occur on adjacent sites. Morphological parameters were primarily responsible for the very different patterns of water stress imposition. Consequently, Arbutus is limited to areas of shorter drought duration than is Heteromeles and this is reflected in their differing distributions.--Copyright 1975, Biological Abstracts, Inc.
W76-09476

DISTRIBUTION OF PONDEROSA PINE FOREST DENSITIES ON THE SALT-VERDE RIVER BASIN,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 4A.
W76-09477

A QUANTITATIVE ANALYSIS OF THE FACTORS AFFECTING PLANT NUTRIENT UPTAKE FROM SOME SOILS,
University of Oxford, Oxford, England, Soil Science Laboratory.
For primary bibliographic entry see Field 2G.
W76-09489

ON THE ECOLOGY OF COLLEMBOLA AND ORIBATIDS IN A LANDSEA TRANSITION ZONE (COLLEMBOLA, INSECTA-ORIBATEI, ACARI) (IN GERMAN),
Kiel Univ. (West Germany). Zoologisches Institut.
For primary bibliographic entry see Field 2L.
W76-09635

A DESCRIPTION OF ATLANTIC MACKEREL, SCOMBER SCOMBRUS, EGGS AND EARLY LARVAE,
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Lab.
P. L. Berrien.
Fishery Bulletin, Vol. 73, No. 1, p 186-192, 1975, 2 fig, 2 tab, 22 ref.

Descriptors: Biology, Embryonic growth stages, *Growth stages, *Eggs, Larvae, Fish.
Identifiers: *Atlantic mackerel.

Eggs and early larvae stages of laboratory reared Atlantic mackerel are described. The purpose was to augment published descriptions of the species. The diameter of the eggs ranged from 1.01 to 1.28 mm and of those that were cultured the mean

diameter was 1.20 mm. The cultured eggs were stripped from a single female. The eggs were spherical and had a single, yellowish oil globule, 0.22 to 0.38 mm in diameter. Soon after blastopore closure, melanophores assume a distinct pattern on the embryo and are present on the oil globule but absent from the yolk surface until immediately prior to hatching. Hatching occurred between 90 and 102 h after fertilization at an average temperature of 13.8 degrees C. This was a slightly faster rate of development than had been previously reported. The yolk-sac stage ended by 137 h for the yolk in all specimens was absorbed by that time. (Chilton-ORNL)
W76-09656

EFFECTS OF FLOODING AND OF IRRIGATION WATER SALINITY ON EUCALYPTUS CAMALDULENSIS DEHN. FROM THREE SEED SOURCES,
Volcani Inst. of Agricultural Research, Ilanot (Israel). Forestry Div.
For primary bibliographic entry see Field 3C.
W76-09664

CONTRIBUTION OF SALTS TO THE WATER POTENTIAL OF WOODY PLANTS,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 3C.
W76-09691

SUGAR BEET PHOTOSYNTHESIS AND PRODUCTIVITY CULTIVATED BY IRRIGATED FARMING IN THE KIRGIZ SSR, (IN RUSSIAN),
Kirghiz State Univ., Frunze (USSR).
For primary bibliographic entry see Field 3F.
W76-09810

PHYTOMASS DYNAMICS OF ABOVEGROUND AND UNDERGROUND ORGANS OF MEADOW STEPPE PLANTS, (IN RUSSIAN),
T. Khoang.
Byull Mosk O-Va Ispyt Prir Otd Biol. 79(4), p 139-141, 1974.

Descriptors: Soil moisture, Vegetation, *Growth rates, *Plant growth, *Plant physiology, Arid lands, Degradation(Decomposition), Deserts, *Meadows, Weather.
Identifiers: Phytomass(Plants), Meadow steppe plants, USSR.

The mass of aboveground plant organs had a single maximum in June due to high soil moisture conditions, followed by a dying-off which peaked in Sept. then decreased due to autumn rains. The underground phytomass had maxima in both June (the higher) and Aug. Accumulation of dead aboveground and underground organs during the vegetation period was associated with varying decomposition rates which in turn depended on weather conditions. In a wet year the aboveground organ mass greatly increased. The underground organs grew more intensively during a hot and dry year. The underground organs apparently develop more strongly both in unfavorable locations (desert and semi-desert) and unfavorable years, although these results could have been due to the periodic growth exhibited by perennials.--Copyright 1975, Biological Abstracts, Inc.
W76-09817

HYDRATABILITY AS A PARAMETER OF PLANT WATER POTENTIAL, (IN FRENCH),
Louvain Univ. (Belgium). Laboratoire d'Ecologie Vegetale.
R. Iserentant.
Bull Soc R Bot Belg. 107(2), p 305-322, 1974.

Descriptors: *Hydration, *Turgidity, Plant physiology, Calibration, Saturation.
Identifiers: *Hydratability, Dry matter, *Water potential(Plants), *Plant water content.

Various expressions of plant water content-water content as a percentage of fresh weight or dry weight, water saturation deficit (WSD) and relative turgidity (RT), hydratability (H)-are critically examined, chiefly as parameters of the water potential (WP), the latter being much more difficult to measure. WSD (or RT) is widely used as a parameter of WP, but the relation WSD (or RT)/WP is specific and calibration is needed for any studied species. Hydratability, which clearly takes into account the ratio of dry matter, displays in terms of WSD a pattern which is similar to that of the WP. The relation H/WP is fairly independent with respect to the specific diversity:hydratability seems thereby a better parameter of the WP than WSD or RT.--Copyright 1975, Biological Abstracts, Inc.
W76-09918

SALINITY TOLERANCE OF INLAND HALOPHYTIC VEGETATION OF NORTH AMERICA,
Caen Univ. (France). Laboratoire de Physiologie Vegetale.
For primary bibliographic entry see Field 3C.
W76-09988

CHANGES IN THE POPULATION OF CLADOCERA AND COPEPODA IN THREE FISHPONDS OF THE DOMBES, (IN FRENCH),
Lyon-1 Univ., Villeurbanne (France). Departement de Biologie Animaux et Zoologie.
C. Amoros.
Ann Limnol. 9(2), p 135-155, 1973.

Descriptors: *Crustaceans, *Copepods, Europe, Carp, Ponds, Climates, Fish, Soils, Fish populations.
Identifiers: *France(Dombes).

Populations of Cladocera and Copepoda were studied in 3 fishponds (in the Dombes, France) of which 1 was refilled with water after 1 yr of culture while empty. The physical-chemial characteristics of the biotope varied with a marked regularity which was a function of climatic factors. Several associations of Cladocera and Copepoda succeeded one another during an annual period after filling with water. The ageing of the pond with reference to its last dry period was shown by a modification of the structure of the crustacean population. Certain species consumed by the carp had a benthic ecophase which enabled them to resist the drainage, the laboring and the cultivation of the soil of the pond; this ensured a rapid repopulation of the pond when it was refilled.--Copyright 1974, Biological Abstracts, Inc.
W76-09995

2J. Erosion and Sedimentation

THE RELATIONSHIP OF THE NEARSHORE LONGSHORE BAR AND SAND WAVES AT OCEAN CITY, MARYLAND,
Geological Survey Baltimore, Maryland.
For primary bibliographic entry see Field 2L.
W76-09569

VISUAL OBSERVATION OF THE SUSPENDED SEDIMENTS AND NEARSHORE ICE SIGNATURES IN CHESAPEAKE BAY,
Maryland Geological Survey, Baltimore.
For primary bibliographic entry see Field 2L.
W76-09571

A PROCEDURE FOR ESTIMATING OFF-SITE SEDIMENT DAMAGE COSTS AND AN EMPIRICAL TEST,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4A.
W76-09632

OVERVIEW OF THE URBAN EROSION AND SEDIMENTATION PROCESSES,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 4C.
W76-09731

EVALUATION AND CONTROL OF SOIL EROSION IN URBANIZING WATERSHEDS,
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
For primary bibliographic entry see Field 4D.
W76-09742

EROSION CONTROL DURING PIPELINE CONSTRUCTION,
Yule, Jordan and Associates, Camp Hill, Pa.
For primary bibliographic entry see Field 5G.
W76-09743

THE INFLUENCE OF URBANIZATION ON STREAM CHANNEL BEHAVIOR,
State Univ. of New York at Buffalo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W76-09744

CHANGES IN THE SEDIMENTATION CHARACTERISTICS OF AN URBANIZING WATERSHED, DALLAS AND COLLIN COUNTIES, TEXAS,
Texas Dept. of Community Affairs, Austin.
For primary bibliographic entry see Field 4C.
W76-09745

PREDICTING SEDIMENT YIELD IN URBAN AREAS,
Soil Conservation Service, College Park, Md.
For primary bibliographic entry see Field 4D.
W76-09746

WATERSHED MANAGEMENT AND SEDIMENT CONTROL IN MONTGOMERY COUNTY,
Environmental Protection Agency, Montgomery County, Md. Storm Water Management Section.
For primary bibliographic entry see Field 4D.
W76-09748

CONCENTRATION OF HEAVY METALS IN SEDIMENTS OF A HYDROELECTRIC IMPOUNDMENT,
Montana Univ., Missoula, Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W76-09755

SEDIMENTATION RATES AND SEDIMENT THICKNESS IN LAKE CHAMPLAIN,
Connecticut Univ., Storrs. Inst. of Water Resources.
J. J. Dowling.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 561, $3.50 in paper copy, $2.25 in microfiche. Research Project Technical Completion Report, 1976. 12 p, 4 fig. OWRT A-066-CONN(1), 14-31-0001-6007.

Descriptors: *Lake basins, *Lake beds, *Bedrock, *Sedimentation rates, *Seismic studies, Erosion, Geophysics, *Lake sediments, Lakes.
Identifiers: *Seismic reflection, Unconsolidated sediment thickness, *Refraction measurements, Air gun, *Lake Champlain.

Geophysical investigations were made in Lake Champlain in order to determine the shape of the bedrock surface underlying the lake and to deter-

mine the total sediment thickness overlying the bedrock. Combined with previous work, these data allowed a determination of a sedimentation rate for the lake. Seismic reflection and refraction measurements were made using a high frequency transducer and a lower frequency high energy air gun system. The results will provide baseline data for shoreline erosion studies associated with proposed lake-level lowering. In addition, knowledge of unconsolidated sediments near shore is of immediate use in siting municipal effluent pipelines. (de Lara-Connecticut)
W76-09759

SEDIMENT PROPERTIES, LAKE CHAMPLAIN: 1971-1975,
Vermont Univ., Burlington. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-09763

THE ERODIBILITY OF PUMICE SOILS OF THE NORTH ISLAND, NEW ZEALAND,
Waikato Univ., Hamilton (New Zealand). Dept. of Earth Sciences.
For primary bibliographic entry see Field 4D.
W76-09787

METHOD OF EVALUATING THE EFFECTIVENESS OF TECHNIQUES FOR INCREASING THE RESISTANCE OF SOILS TO EROSION, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
For primary bibliographic entry see Field 4D.
W76-09805

RELATIONSHIP OF HEAVY RAINFALL TO SOIL EROSION IN VIEW OF ITS FORECASTING, (IN BULGARIAN),
Afforestn. Erosion Control Experimental Station, Sandanski (Bulgaria).
A. Mandev.
Groskostop Nauka. 11(1), p 51-58, 1974.

Descriptors: *Soil erosion, Rainfall, *Forecasting, *Rainfall intensity, *Excessive precipitation, Measurement.

Results were obtained from the measurement of the amount of eroded soil from a permanent plot, 25 m long and 4 m wide, under cultivation, with a slope of 25 degree. Out of the 17 indices of torrential rainfall studied, the most suitable ones proved to be the indices of Wischmeier and Smith, 1958 (W30) and of Stanescu et al., 1968 (R2). Owing to the considerably smaller volume of calculations, the R2 = QI30 index, suggested by Stanescu et al. is recommended. The regression equation of that relationship is Y = 407.91R2 + 881.32, with a correlation coefficient of 0.971 and a variance coefficient of 0.167. In the case of heavy rainfall with a duration of less than 30 min, the R6 = QI30 index is recommended for use with an equation Y = 202.78R6 + 210.37 correlation coefficient 0.972 and 0.21 variance coefficient.--Copyright 1975, Biological Abstracts, Inc.
W76-09807

HYDROLOGY AND SEDIMENTATION OF BIXLER RUN BASIN, CENTRAL PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
L. A. Reed.
Water-Supply Paper 1798-N, 1976. 20 p, 11 fig, 3 tab, 11 ref.

Descriptors: *Sediment transport, *Streamflow, Hydrologic data, *Surface-groundwater relationships, *Water quality, Sediment control, Evaluation, Hydrology, Topography, Geology, Agriculture, Sediment discharge, Particle size, Water chemistry, *Pennsylvania.
Identifiers: *Bixler Run basin(Pa).

Rainfall, streamflow, water quality, and sediment discharge data were collected from Bixler Run near Loysville, Pa., from February 1954 to September 1969 to evaluate sediment discharge from an agricultural area in which soil-conservation techniques were being adopted at a moderate rate. The study was conducted by the U. S. Geological Survey in cooperation with the Pennsylvania Department of Environmental Resources, State Conservation Commission. Sediment yields from the basin averaged 64 tons per square mile (22 tonnes per square kilometre) per year, approximately 25 percent less than yields from the surrounding area. The relation between water discharge and suspended-sediment discharge remained constant during the study. Suspended-sediment concentration of chloride ions in the streamflow increased from 1959 to 1969. Groundwater maintained flow at the gaging location at a rate of 1.9 cubic feet per second (0.054 cubic metres per second) during the period of data collection. (Woodard-USGS)
W76-09830

A PRIMER ON FLOODPLAIN DYNAMICS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-09831

CENOZOIC DEPOSITS OF SOUTHEASTERN NEW MEXICO AND AN OUTLINE OF THE HISTORY OF EVAPORITE DISSOLUTION,
Geological Survey, Colo.
G. O. Bachman.
Journal of Research of the U S Geological Survey, Vol 4, No 2, p 135-149, March-April 1976. 8 fig, 2 tab 34 ref.

Descriptors: *Fluvial sediments, *Sediment transport, *Sedimentology, *Geologic formations, *New Mexico, Geologic history, Erosion, Evaporation, Sediments.
Identifiers: *Evaporite dissolution.

Sedimentary records of Cenozoic history in southeastern New Mexico begin with the Ogallala Formation of Miocene and Pliocene age. Later records include the Gatuna Formation of early or middle Pleistocene age, Mescalero caliche, an informal term, of middle Pleistocene age, and fluvial deposits of late Pleistocene age but there are many gaps in the record. The modern landscape is the result of erosion and deposition in climates that have ranged from semihumid to semiarid as well as dissolution of soluble rocks in Permian formations in the subsurface. This dissolution may have begun as early as Jurassic time and has continued intermittently to the present. (Woodard-USGS)
W76-09837

VARIATION AND CAUSATIVE FACTORS OF SEDIMENT YIELDS IN THE ARKANSAS RIVER BASIN, KANSAS,
Geological Survey, Lawrence, Kans.
W. R. Osterkamp.
Available from the National Technical Information Service, Springfield Va. 22161, as PB-245-100/3GI (Proceedings) Printed copy $23.75 Microfiche $15.00. Reprint from Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976, held at Denver, Colorado, March 22-25, 1976: Water Resources Council, Sedimentation Committee, p 1-59 - 1-70, 1975. 7 fig, 1 tab, 7 ref.

Descriptors: *Sediment transport, *Sediment yield, *River basins, Arkansas, Forecasting, Data collections, Streamflow, Flow rates, Curves, Equations, *Kansas.
Identifiers: *Arkansas River basin(Kan).

Measured sediment yields in the Arkansas River basin of Kansas range from about 10 to 500 tonnes per year per square kilometre (30 to 1,430 tons per year per square mile); highest yields occur in the eastern third of the basin and low yields occur in various parts of the western two-thirds. Yields predicted from general curves based on climate (Schumm, 1965) agree poorly with measured yields. To improve the correlation between calculated (predicted) and measured yields, the climate-dependent curves are converted to a single curve dependent on runoff. The yields predicted by this curve for specific areas are adjusted by applying a power function of average slope. Where other determinants of sediment discharge do not increase or decrease yields significantly, adjusted yields agree with those measured. Discrepancies between the calculated and measured yields generally are inferred to be a result of geologic influences. Calculation of the adjusted yields permits a refined delineation of areal variations in sediment yields based on sample data, and provides a means of estimating yields from unsampled basins. (Woodard-USGS)
W76-09839

STORM-PERIOD VARIABLES AFFECTING SEDIMENT TRANSPORT FROM URBAN CONSTRUCTION AREAS,
Geological Survey, Parkville, Md.
W. J. Herb, and T. H. Yorke.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 100/3GI (Proceedings). Printed copy $23.75, Microfiche $15.00. Reprint from Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976, held at Denver, Colorado, March 22-25, 1976: Water Resources Council Sedimentation Committee, p 1-181 - 192, 1975. 13 p, 1 fig, 2 tab, 1 ref.

Descriptors: *Sediment transport, *Small watersheds, *Construction, *Urbanization, *Maryland, Effects, Peak discharge, Storm runoff, Data collections, Equations, Correlation analysis, District of Columbia.
Identifiers: *District of Columbia area.

Eight small drainage basins, ranging in size from 0.91 to 25.2 square kilometres (0.35 to 9.73 square miles), located in the suburbs of Washington, D. C., were studied between 1963 and 1974 to determine sediment transport characteristics of streams draining urban construction areas. Annual construction ranged from less than 1 percent of basin area to more than 15 percent. Five hundred and twenty-four storms were analyzed to determine the effects of 14 storm-period variables on sediment load. Factors found to be most significant were storm runoff and peak discharge. Multiple correlation coefficients for best regression equations with four independent variables ranged from 0.85 to 0.96, and standard errors ranged from 0.300 to 0.221 log units. The equations reflect the significant impact of both construction activities and summer storms on the sediment discharge of urban streams. (Woodard-USGS)
W76-09840

URBAN-AREA SEDIMENT YIELD--EFFECTS OF CONSTRUCTION-SITE CONDITIONS AND SEDIMENT-CONTROL METHODS,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 4D.
W76-09841

PROPOSED REVISION TO THE MODIFIED EINSTEIN METHOD OF COMPUTING TOTAL SEDIMENT DISCHARGE,
Geological Survey, Menlo Park, Calif.
D. E. Burkham, and D. R. Dawdy.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 100/3GI (Proceedings). Printed copy $23.75, Microfiche $15.00. Reprint from Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976, held at Denver, Colorado, March 22-25, 1976: Water Resources Council, Sedimentation Committee, p 4-37 4-49, 1975. 2 fig, 1 tab, 7 ref.

Descriptors: *Sediment discharge, *Open channels, *Equations, *Computer programs, Methodology, Correlation analysis, Channel morphology, Sediment yield, Sediment load.
Identifiers: *Einstein method(Modified).

Corrections are applied to four equations used in the modified Einstein method of computing total sediment discharge in open channels. The corrections eliminate some of the empiricism in the procedure. The revised modified procedure gives computed sediment discharges that apparently are as accurate as the modified procedure. (Woodard-USGS)
W76-09842

TEN YEARS OF EXPERIENCE WITH AUTOMATIC PUMPING-SEDIMENT SAMPLERS,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 7B.
W76-09843

ORIGIN, EFFECT AND SUPPRESSION OF SECONDARY WAVES,
Waterloopkundig Laboratorium, Delft (Netherlands).
C. H. Hulsbergen.
Available from the National Technical Information Service, Springfield, Va., 22161, as N75-20968 H2/E, $3.50 in paper copy, $2.25 in microfiche. Presented at: International Conference on Coastal Engineering, 14th, Copenhagen, June 24-28, 1974. Reprint, Publication No. 132, September 1974. 21 p, 28 fig, 35 ref.

Descriptors: *Waves(Water), *Beach erosion, *Sediment transport, Movement, Sand bars.
Identifiers: Secondary waves, Wave action.

Beach profile formation may be severely affected by secondary waves which, together with the basic wave, always originate from a sinusoidally-moving wave board. The ascertainment of this experimental fact is followed by an investigation of the behaviour of the generated waves and their interactions. It was concluded that: secondary waves may be generated by the wave board, or may be provoked by a sill, bar, slope, or by breaking waves; secondary waves, generated by the wave board, may adequately be described by combining the theories of Fontanet (1961), and Dravtchenko and Santon (1957); secondary waves may have a very pronounced influence on beach profile formation, although this influence may be quite difficult to recognize as such; the rate and the direction of the transverse sand transport under waves is very delicately dependent of the wave form, i.e. the form of the orbital velocity field; and an adequately designed sill of rectangular cross-section may be used to suppress the Fontanet wave. (Sinha-OEIS)
W76-09878

INVESTIGATIONS ON THE ERODIBILITY OF A DEEPLY PLOWED GRAY-BROWN PODZOLIC SOIL FROM LOESS ON A SLOPE BY MEANS OF SIMULATED RAIN, (IN GERMAN),
Niedersaechsisches Landesamt fuer Bodenforschung, Hanover (West Germany).
B. Grosse, and M. Renger.
Z Pflanzenernaehr Bodenkd. 137(2), p 86-94, 1974.

Descriptors: *Erosion, Loess, *Podzols, Slopes, *Gray-brown podzolic soils, Simulated rainfall, Infiltration, Cultivation, Soil horizons, Soil types.

Simulated rain of about 45 mm (intensity = 0.16 mm/min) on deeply plowed soil with a 4% slope caused light puddling so that neither soil removal nor run-off occurred. A normally plowed plot of the same size (150 m2) showed heavy puddling and a low run-off after a sprinkling time of 20 min. After 120 min the run-off amounted to about 2.5 mm (= 20% of the rain quantity) and the soil removal was measured at 3 kg (=200 kg/ha). Soil removal by rain storms from normally plowed gray-brown podzolic soil is mainly effected by the decrease of the infiltration rate due to the puddling of the upper layers of the Ap-horizon.--Copyright 1975, Biological Abstracts, Inc.
W76-09917

MATHEMATICAL MODELING OF ALLUVIAL CHANNELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-09968

MOVABLE-BED RIVER-MODELS,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 2E.
W76-09969

SEDIMENT DEPOSITION MODEL FOR TARBELA RESERVOIR,
Gilbert Associates, Inc., Reading, Pa.
A. J. Hurst, and P. C. Chao.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 501-520, 1975. 10 fig, 11 ref.

Descriptors: *Model studies, *Sedimentation, *Rivers, *Reservoirs, Erosion, Suspended solids, Sediments, Sediment transport, Mathematical models, Computer models, Reservoir operation.
Identifiers: *India, *Tarbela Reservoir(India), *Indus River(India).

In an average year, the Indus River will carry over 400 million tons of sediment into Tarbela Reservoir. It was determined that analysis of the reservoir operating criteria could provide for optimization of the natural impermeable blanketing immediately upstream of the main dam. Suspended sediment deposition was investigated using a computer program based on the Sundborg and Camp solutions. Both are exponential decay functions; the first was designed for reservoirs, the second for desilting basins. The model was designed for an 18-month simulation on a daily flow basis and uses 200 K bytes of memory on an IBM 360/370 computer. It is basically two-dimensional, in that velocity distributions across the sections were not accounted for. Twenty eight sections comprised the model reservoir, stretching back 50 miles. A flow routing was performed, with velocities, shear velocities, and water levels determined at each section. Each days' sediment inflow load was tracked entirely through the reservoir; the objective was the determination of the probable location, extent, and grading of sediment deposition. There was an excellent correlation between the two methods of analysis, and a desirable means of operating the reservoir to induce sedimentation in predetermined reaches was established. (See also W76-09941) (Sims - ISWS)
W76-09970

UNDISTORTED MOVABLE-BED MODEL STUDY FOR A RIVER AND POWER PLANT INTAKE SYSTEM,
Battelle Memorial Inst., Richland, Wash.
For primary bibliographic entry see Field 8B.
W76-09971

MODELING OF MEANDERING AND BRAIDING IN RIVERS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
G. Parker, and A. G. Anderson.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 575-591, 1975. 6 fig, 1 tab, 24 ref. NSF ENG74-02777.

Descriptors: *Model studies, *Rivers, *Meanders, *Braiding, Alluvial channels, Sediments, Sediment transport, Streamflow, Erosion, Sedimentation, Channel morphology, Hydraulics, Hydraulic models.
Identifiers: *River models, Modeling techniques.

The results of stability analyses of meander- and braid-like perturbations in straight rivers were used to construct a diagram dividing rivers into straight, meandering, and braided regimes. The same analysis provided order-of-magnitude estimates of meander and braid longitudinal wavelength and braid number. The relations indicated that if the geometric and Froude criteria are applied to river models, and if sediment transport exists in both the model and the prototype, the occurrence of meandering and braiding and incipient meander and braid wavelengths are modelled to the correct order of magnitude. Sediment transport itself need not be modelled as long as it exists. The analysis justified the use of light bed material such as coal or plastic rather than sand in river models as a means of ensuring the existence of sediment transport, in that the initial tendencies toward meandering or braiding are not greatly altered. The modeling method is useful for testing the erosive tendencies of streams that have been channelized in a straight alignment; such streams often show a tendency to return to the original meandering or braiding state. (See also W76-09941) (Sims - ISWS)
W76-09974

MODELING SEDIMENT TRANSPORT IN HYDRAULIC STRUCTURES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
K. Mahmood.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 592-604, 1975. 8 fig, 9 ref, 1 append. NSF ENG72-00274 A01.

Descriptors: *Model studies, *Alluvial channels, *Sediment transport, *Hydraulic structures, Mathematical models, Sediments, Sedimentation, Sands, Canals, Irrigation, Bed load, Suspended solids, Rivers, Hydraulics.
Identifiers: Vortex tube sand traps, Irrigation turnouts, Sand-bed canals.

Water resource developments on alluvial streams often involve sediment loads that need to be routed through the systems. This routing depends on the sediment transport characteristics of the constituent hydraulic structures. Small scale physical modeling of sediment transport through structures is difficult because it is generally impossible to simultaneously satisfy the governing equations for the hydraulic and sedimentation phenomena. Mathematical models are being increasingly developed for these studies. Where possible, the mathematical models have the advantages of low cost, increased generality, and economy of time. Development of three mathematical models of sediment transport in hydraulic structures were presented here. These models were developed in the context of sediment routing in surface irrigation systems. Specifically the models related to vortex tube sand traps, irrigation turnouts, and bed level transients in sand-bed canals. (See also W76-09941) (Sims - ISWS)
W76-09975

2K. Chemical Processes

CHANGES IN WATER CHEMISTRY RESULTING FROM SURFACE-MINING OF COAL ON FOUR WEST VIRGINIA WATERSHEDS,
Forest Service (USDA), Berea, Ky. Northeast Forest Experiment Station.
For primary bibliographic entry see Field 4C.
W76-09470

FOREST MANAGEMENT PRACTICES AS RELATED TO NUTRIENT LEACHING AND WATER QUALITY,
Northeastern Forest Experiment Station, Pennington, N. J.
For primary bibliographic entry see Field 4C.
W76-09471

EXPLORATION ROCK GEOCHEMISTRY-DETECTION OF TRACE ELEMENT HALO AT HEATH STEELE MINES (N. B., CANADA) BY DISCRIMINANT ANALYSIS,
New Brunswick Univ., Fredericton, Dept. of Geology.
R. E. S. Whitehead, and G. J. S. Govett.
Journal of Geochemical Exploration, Vol 3, No. 4, p. 371-386, November, 1974, 9 fig, 1 tab, 21 ref.

Descriptors: *Geochemistry, *Sulfides, *Trace element, *Minerology, Zinc, Lead, Copper, Canada, *Pollutant identification.
Identifiers: *Geochemical exploration.

The Heath Steele massive sulphide deposit in Northern New Brunswick lies conformably within a sedimentary-volcanic sequence of probable Ordovician age which has been metamorphosed to the greenschist stage. The dominant sulphide mineral is pyrite, and the main economic minerals are sphalerite, galena, and chalcopyrite; the general grade of the ore is 5% Zn, 2% Pb, and 1% Cu. The results demonstrate the use of discriminant analysis in defining a trace element halo which is of considerable size in rocks which overlie mineralization at Heath Steele Mines and is spatially associated with the sulfides. The halos are faint and can only be reliably recognized through a multielement statistical classification of samples. (Hoyle-Vanderbilt)
W76-09473

REDOX POTENTIAL IN IRRIGATED DESERT SOILS AS AN INDICATOR OF AERATION STATUS,
Imperial Valley Conservation Research Center, Brawley, California.
For primary bibliographic entry see Field 2G.
W76-09488

WATER CHEMISTRY OF THE ST. LAWRENCE ESTUARY,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
For primary bibliographic entry see Field 5A.
W76-09581

CHEMISTRY OF DISSOLVED INORGANIC CARBON IN ESTUARINE AND COASTAL BRACKISH WATERS,
Groningen Rijksuniversiteit (Netherlands). Environmental Isotopes Lab.
For primary bibliographic entry see Field 2L.
W76-09597

DISSOLVED OXYGEN ANALYZER T-01 ANALYZER. A SIMPLE APPARATUS FOR ELECTROCHEMICAL DETERMINATION OF DISSOLVED OXYGEN IN WATER (TLENOMIERZ T-01 UPROSZCZONY PRZYRZAD ELEKTROCHEMICZNEGO OZNACZANIA TLEUNU ROXPUSZCZOMEGO W ROZTWORACH WODNYCH),
For primary bibliographic entry see Field 5A.
W76-09688

REMOVAL OF DISSOLVED BORON AND SILICON DURING ESTUARINE MIXING OF SEA AND RIVER WATERS,
University of East Anglia, Norwich (England). School of Environmental Sciences.
P. S. Liss, and M. J. Pointon.
Geochim Cosmochim Acta. 37(6), p 1493-1498, 1973.

Descriptors: *Boron, Sea water, Mixing, Estuaries, Water chemistry.
Identifiers: England, *Silicon, Alde River.

The behavior of dissolved B and S: during mixing of sea and river waters was studied in 2 surveys of the estuary of the River Alde in Suffolk, England. Removal of approximately 25-30% was found for both elements. This appears to be the 1st report of estuarine removal of dissolved B. The extent of removal of Si in the Alde was somewhat higher than that found in other estuaries.--Copyright 1974, Biological Abstracts, Inc.
W76-09725

CHARACTERIZATION OF NITROGEN SOURCES CONTAMINATING SHALLOW GROUND WATER IN AN ARID BASIN. LAS VEGAS AREA, NEVADA,
Nevada Univ., Reno. Center for Water Resources Research; and Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 5B.
W76-09762

LEAD ORTHOPHOSPHATES: III. STABILITIES OF FLUOROPHYROMORPHITE AND BROMOPYROMORPHITE AT 25 C,
Canada Centre for Inland Waters, Burlington (Ontario).
J. O. Nriagu.
Geochim Cosmochim Acta. Vol 37, No 7, p 1735-1743, 1973.

Descriptors: *Lead, Phosphates, Chemical reactions, Water chemistry.
Identifiers: Lead orthophosphate, Fluoropyromorphite, Bromopyromorphite.

The reactions of secondary lead orthophosphate with approximately 10-1 M NaF fluoride and NaBr solutions were investigated at 25 C. Interpretation of the solubility data resulted in solubility product constants for fluoropyromorphite and bromopyromorphite of 10-71.6 and 10-78.1, respectively. According to these constants, the stability sequence for lead pyromorphites is Pb5(PO4)3C1>Pb5(PO4)3Br>Pb5(PO4)3OH>Pb 5(PO4)3F. The derived free energy data were used to evaluate the respective stabilities of fluoropyromorphite and bromopyromorphite within the systems PbF2-PbO-P2O5-H2O and PbBr2-PbO-P2O5-H2O and to predict the equilibrium behavior of the Pb5(PO4)3F - Pb5(PO4)3OH solid solution under aqueous conditions. (These studies are relevant to Pb in aqueous solution and under physiological conditions.)(See also W75-06303)--Copyright 1974, Biological Abstracts, Inc.
W76-09820

APPRAISAL OF WATER RESOURCES OF NORTHWESTERN EL PASO COUNTY, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2E.
W76-09828

DETERMINATION, STORAGE, AND PRESERVATION OF LOW MOLECULAR WEIGHT HYDROCARBON GASES IN AQUEOUS SOLUTION,
Geological Survey, Bay Saint Louis, Miss.
D. J. Shultz, J. F. Pankow, D. Y. Tai, D. W. Stephens, and R. E. Rathbun.
Journal of Research of the U S Geological Survey, Vol 4, No 2, p 247-251, March-April 1976. 3 fig, 4 tab, 4 ref.

Descriptors: *Gases, *Organic compounds, *Aqueous solutions, *Analytical techniques, Gas chromatography, Ionization, Sampling, Preservation, Storage, Methodology, Water analysis, Reaeration, Preservation.
Identifiers: *Hydrocarbon gases.

A gas chromatograph with a flame ionization detector was used in conjunction with a stripping chamber and cold trap apparatus to measure microgram-per-litre quantities of low molecular weight hydrocarbon gases in water samples. Glass bottles with ground-glass stoppers were used to store the samples. Formalin was added to stop bacterial activity and preserve samples with no measurable losses for as much as 7 days. (Woodard-USGS)
W76-09834

GEOCHEMICAL AND ISOTOPIC ANALYSES OF WATERS ASSOCIATED WITH THE EDWARDS LIMESTONE AQUIFER, CENTRAL TEXAS,
Geological Survey, Reston, Va.
F. J. Pearson, Jr., and P. L. Rettman.
Geological Survey Report, February 1976. 35 p, 3 fig, 5 tab, 25 ref.

Descriptors: *Chemical analysis, *Groundwater, *Water chemistry, *Geochemistry, *Texas, *Water analysis, Data collections, Sampling, Isotope studies, Analytical techniques, Chemical reactions, Aquifers.
Identifiers: *Edwards Limestone aquifer(Tex).

The results of analyses of 14 common chemical species dissolved in 92 samples of waters from the Edwards Limestone aquifer in central Texas are tabulated. Additional analyses for stable carbon and radiocarbon and stable sulfur isotopes on 34 of these samples are included. Field collection and field and laboratory analytical techniques were designed to make these analyses useful for geochemical studies. Edwards waters can be grouped into five chemical types--recharge, main fresh water, varied, and two types of transitional and saline waters. All types are saturated with calcite and all transitional and saline waters are saturated with dolomite as well. Some saline samples are also saturated with gypsum, celestite, strontianite, and fluorite. (Woodard-USGS)
W76-09836

TECHNIQUE OF WATER SAMPLING IN SANITARY INVESTIGATIONS OF LARGE BODIES OF WATER, (IN RUSSIAN),
Kazan Inst. of Postgraduate Medicine (USSR).
For primary bibliographic entry see Field 5A.
W76-09928

2L. Estuaries

STUDIES OF PHYTOPLANKTON ECOLOGY IN THE BAY OF VALPARAISO: II. PHYTOPLANKTON 1970-1971, (IN SPANISH),
Chile Univ., Vina del Mar. Departamento de Oceanologia.
For primary bibliographic entry see Field 5A.
W76-09408

A SITE STUDY OF THE MULTIPLE EFFECTS OF THERMAL RELEASES ON THE AQUATIC LIFE IN AN ESTUARINE AREA,
Ente Nazionale per l'Energia Elettrica, Milan (Italy).
For primary bibliographic entry see Field 5C.
W76-09505

ISLAND BARRIER EFFECTS ON SEA STATE AS REVEALED BY A NUMERICAL WAVE MODEL AND DMSP SATELLITE DATA,
Environmental Prediction Research Facility, Monterey, Calif.
R. W. Fett, and K. M. Rabe.
Journal of Physical Oceanography, Vol. 6, No. 3, p 324-334, May 1976. 14 fig, 15 ref.

Descriptors: *Remote sensing, *Model studies, *Islands, *Ocean waves, Satellites(Artificial), Mathematical models, Waves(Water), Eddies, Oceans, Winds, Meteorology, Oceanography.
Identifiers: *Sea state, Sunglints.

Island barrier effects on the state of the sea in the lee of islands have been studied by means of a numerical wave prediction model and by examination of data from sensors of the Defense Meteorological Satellite Program (DMSP), the Synchronous Meteorological Satellite (SMS), and the Earth Resources Technology Satellite (ERTS). Visual indications of calm areas in the lee of the Lesser Antilles, evidenced by a marked reduction in the satellite-observed sunglint at selected sun angles, were verified by the results from the numerical wave model; other lee reflective patterns correspond to areas of changed sea state. These results indicated that a reduction in the swell height, alteration of the period, and reorientation of the swell direction, in many instances long distances to the island's lee, are responsible for the satellite-observed reflective patterns noted. The additional phenomena of bow waves and wind-induced oceanographic eddies were also examined, and some evidence of their occurrence and detection was presented. (Sims - ISWS)
W76-09559

FINITE-AMPLITUDE BAROCLINIC DISTURBANCES IN DOWNSTREAM VARYING CURRENTS,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
J. Pedlosky.
Journal of Physical Oceanography, Vol. 6, No. 3, p 335-344, May 1976. 4 fig, 2 ref.

Descriptors: *Ocean currents, *Currents(Water), *Model studies, Mathematical models, Circulation, Downstream, Water circulation, Fluid mechanics, Oceanography.
Identifiers: *Baroclinic disturbances.

The finite-amplitude dynamics of baroclinic disturbances in currents whose cross-stream structure varies in the downstream direction was investigated. It was first shown under what circumstances downstream variations of the current properties influence the local stability of the current. For flows near the neutral curve only the potential vorticity in one of the fluid layers is significant in determining the local stability. For currents which are locally stable at some downstream locations and unstable at others, it was shown that the disturbance amplitude depends on the entire upstream structure of the current. In particular, simple examples illustrated the lack of a local relationship between 'local' stability characteristics and the disturbance intensity. The linear initial value problem for uniform (in the downstream) direction) currents was also discussed to elucidate the relation between the temporal and spatial stability problems. (Sims - ISWS)
W76-09560

VELOCITY OBSERVATIONS IN THE WEST PASSAGE OF NARRAGANSETT BAY: A PARTIALLY MIXED ESTUARY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
R. H. Weisberg, and W. Sturges.
Journal of Physical Oceanography, Vol. 6, No. 3, p 345-354, May 1976. 10 fig, 4 tab, 15 ref. ONR N00014-68-A-0215-0003.

Descriptors: *Estuaries, *Currents(Water), *Tides, *Rhode Island, Winds, Tidal waters, Flow, On-site investigations, Water circulation, Velocity, Current meters, Wind velocity, Wind tides, Water, Rivers, Coasts, Data processing, Oceanography, Mixing.
Identifiers: *Narragansett Bay(RI).

Narragansett Bay is a weakly stratified estuary comprised of three connecting passages of varying depths. The vertical distribution of horizontal velocity was observed in the West Passage using moored current meters. The instantaneous motion was characterized by semi-diurnal tidal currents of amplitude 25-60 cm/s. The net current time series obtained by filtering out motions at tidal and higher frequencies were found to be an order of magnitude less than the instantaneous motion and well correlated to the prevailing 2-10 m/s winds. For periodicities of 2-3 days, the coherence between the longitudinal components of wind and net near surface current was as high as 0.8 with the current lagging the wind by about 3 h. The mean near surface speed, obtained by averaging over one month, was 1.2 + or - 1.6 cm/s. The large error bounds were a result of the large variability of the net current time series. The net transport of water through the West Passage was observed to be seaward or landward over the entire water column for several days duration, with typical wind induced transport fluctuation of + or - 500 cu m/s. Hence, a net communication of water exists between the East and West Passages with water flowing either way in response to the wind. Wind was concluded to be the dominant mechanism driving the net circulation in the West Passage of Narragansett Bay. This is in contrast with the classical views of gravitationally convected net estuarine circulation. (Sims - ISWS)
W76-09561

RESEARCH AND INVESTIGATION OF GEOLOGY, MINERAL, AND WATER RESOURCES OF MARYLAND.
Geological Survey, Baltimore. Maryland
For primary bibliographic entry see Field 4A.
W76-09565

MARYLAND CHESAPEAKE BAY BEACHES - GENERAL DISTRIBUTION AND CLASSIFICATION,
Geological Survey, Baltimore, Maryland.
R. T. Kerhin, and T. H. Slaughter.
In: Research and Investigation of Geology, Mineral and Water Resources of Maryland. Final Report, Maryland Geological Survey, Johns Hopkins University, Baltimore, p 3-1 to 3-29, September 1974. 6 fig, 2 tab. NASA NAS5-21848.

Descriptors: *Remote sensing, *Beaches, *Chesapeake Bay, *Maryland, Satellites(Artificial), Aircraft, Photography, Data processing, Aerial photography, Shores, Bays, Classification, Mapping.
Identifiers: *ERTS, Broad beaches, Narrow beaches, Data misinterpretation.

The effectiveness of ERTS-1 multispectral imagery to detect small-scaled beach features with strict manual image interpretations is dependent on two factors: the contrast at the land/water interface and the linearity of the beach system. Through ground truth verification, four misinterpretations were recognized. The most common condition for misinterpretation of the beach signature is fill material behind a bulkhead. The other misinterpretations are nearshore turbidity, vertical sedimentary cliffs, and shoreline erosion control structures. Based on ERTS-1 imagery and aircraft support data, beaches of Chesapeake Bay were classified as broad and narrow beaches based on the width of the backshore zone. The predominate beach type is narrow beaches existing throughout the Bay while the broad beaches are confined to the western shore. The broad beaches accounted for 121 Km of beach length and are dominate in Calvert and St. Mary's counties. With the use of ERTS-1 imagery, actual ground truth mapping is not needed for a major beach system and ground truth observations can be concentrated in areas of misinterpretation. (See also W76-09565) (Sims - ISWS)
W76-09568

THE RELATIONSHIP OF THE NEARSHORE LONGSHORE BAR AND SAND WAVES AT OCEAN CITY, MARYLAND,
Geological Survey Baltimore, Maryland.
T. H. Slaughter.
In: Research and Investigation of Geology, Mineral and Water Resources of Maryland. Final Report, Maryland Geological Survey, Johns Hopkins University, Baltimore, p 4-1 to 4-16, September 1974. 7 fig. NASA NAS5-21848.

Descriptors: *Sand waves, *Coasts, *Atlantic Ocean, *Maryland, *Remote sensing, On-site investigations, Satellites(Artificial), Aircraft, Beaches, Erosion, Beach erosion, Sedimentation, Sediments, Deposition(Sediments).
Identifiers: *ERTS, *Ocean City(Md), Longshore bars, Reversal zones.

By comparing historical shorelines of Ocean City, from the inlet to the Maryland-Delaware line, it was shown that reversal zones of erosion and accretion occur at different locations for different periods. The Atlantic Ocean coastline assumes at times a crescentic form called sand waves whose existence is related to shape and location of the nearshore bar. Because of climatic and wave conditions, the offshore bar is changed causing obliteration of the sand waves. The sand waves in response to bar metamorphosis change size, location, and existence. (See also W76-09565) (Sims - ISWS)
W76-09569

LINEAR DISTRIBUTION OF THE HIGH MARSH VEGETATION COMMUNITIES OF THE LOWER EASTERN SHORE AND ITS GEOLOGICAL SIGNIFICANCE,
Geological Survey, Baltimore, Maryland.
R. T. Kerhin.
In: Research and Investigation of Geology, Mineral and Water Resources of Maryland. Final Report, Maryland Geological Survey, Johns Hopkins University, Baltimore, p 5-1 to 5-19, September 1974. 5 fig, 1 tab. NASA NAS5-21848.

Descriptors: *Remote sensing, *Coastal marshes, *Vegetation, *Topography, *Maryland, Coasts, Geomorphology, Satellites(Artificial), Wetlands, Marshes, Soils, Sands, Sand waves, Shores.
Identifiers: *ERTS, *Janes Island(Md), Linear ridges, High marsh vegetation.

Using ERTS-1 multispectral imagery and aircraft support, the distribution of the high reflectance levels (high marsh-high topographic areas) for the Lower Eastern Shore were distributed as two distinct trending linear ridge systems. On the western side of Tangier Sound the linear ridges trend in a northwest-southeast pattern and on the eastern side the linear ridges trend in a northeast-southwest pattern with a projected convergence at the Maryland-Virginia line. The northeast-southwest trending linear ridges on Janes Island were selected as a ground truth site for signature return and vegetation type correlation. The linear ridges correlated with high marsh/upland vegetation and appeared on the aircraft support and

ERTS-1 imagery as high reflectance levels. A shallow stratigraphic section of a linear ridge displayed 10-20 cm root zone followed by a brown-tan to gray clay layer to 89 cm overlying a red-stained medium sand. The intersection of the linear ridge with the shoreline exposed a wave-cut bench of the root zone and brown-tan clay found in the cross-section. (See also W76-09565) (Sims - ISWS)
W76-09570

VISUAL OBSERVATION OF THE SUSPENDED SEDIMENTS AND NEARSHORE ICE SIGNATURES IN CHESAPEAKE BAY,
Maryland Geological Survey, Baltimore.
R. T. Kerhin.
In: Research and Investigation of Geology, Mineral and Water Resources of Maryland. Final Report, Maryland Geological Survey, Johns Hopkins University, Baltimore, p 6-1 to 6-10, September 1974. 5 fig. NASA NAS5-21848.

Descriptors: *Remote sensing, *Suspended solids, *Ice, *Chesapeake Bay, Sediments, Turbidity, Sediment transport, Sediment load, Rivers, Beaches, Satellites(Artificial).
Identifiers: *ERTS, Beach ice, Nearshore ice.

Observations of MSS band 5 dated April 9, 1974 exhibited an unique sedimentation pattern for Chesapeake Bay. Following a 1.5 inch rainfall, heavy concentration of suspended sediments was observed on the imagery, particularly in the area of the turbidity maximum. At some of the major tributaries, a suspended sediment wedge was observed showing an upstream transportation direction. During January and February, 1973, a freeze-thaw-freeze condition existed with beach and nearshore ice observed on ERTS-1 imagery. Beach ice can be mistaken for a beach signature on MSS band 7 and nearshore ice can be misinterpreted as nearshore turbidity on MSS band 5. (See also W76-09565) (Sims-ISWS)
W76-09571

WATER CHEMISTRY OF THE ST. LAWRENCE ESTUARY,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
For primary bibliographic entry see Field 5A.
W76-09581

ENERGY DISSIPATION ON A ROUGH SLOPE,
Massachusetts Inst. of Tech., Cambridge Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 8B.
W76-09582

OBSERVATIONS OF THE CALIFORNIA UNDERCURRENT OFF WASHINGTON AND VANCOUVER ISLAND,
National Oceanic and Atmospheric Administration, Seattle, Wash., Pacific Marine Environmental Lab.
R. K. Reed, and D. Halpern.
Limnology and Oceanography, Vol. 21, No. 3, p 389-398, May 1976. 7 fig, 27 ref.

Descriptors: *Oceans, *Ocean currents, *Pacific Ocean, *Washington, *Canada, Continental shelf, On-site investigations, Measurement, Internal waves, Salinity, Temperature, Currents(Water), Flow, Coasts, Oceanography.
Identifiers: *Vancouver Island(BC).

A detailed oceanographic survey was conducted in the Pacific off the coast of Washington and Vancouver Island in September 1973, and 12-h time-series measurements were made at eight sites. Data from the time-series stations suggested the presence of semi-diurnal internal tidal waves seaward of the continental shelf. The resulting disturbances to the geopotential anomalies, however, had little effect on the derived patterns of geostrophic flow. During this survey, the surface flow relative to 1000 db was generally southward, but a northward flow was present at intermediate depths along the continental slope. This northward flow appeared to be an extension of the California Undercurrent, which remains an identifiable feature to at least 49 deg N but weakens along its path by mixing with adjacent water. An additional northward flow in the northern part of the area resulted from a cyclonic eddy-like feature. (Sims - ISWS)
W76-09584

UPWELLING NEAR SAMALGA PASS,
Washington Univ., Seattle. Dept. of Oceanography.
J. H. Swift, and K. Aagaard.
Limnology and Oceanography, Vol. 21, No. 3, p 399-408, May 1976. 9 fig, 8 ref. NSF GA11147A3.

Descriptors: *Upwelling, *Oceans, *Pacific Ocean, *Alaska, Circulation, Ocean circulation, Oxygen, Nutrients, Density, Salinity, On-site investigations, Ocean currents, Winds, Subsurface flow, Euphotic zone, Oceanography.
Identifiers: *Aleutian Islands(Alas), *Samalga Pass(Alas).

Recent summer hydrographic data from the vicinity of Samalga Pass in the eastern Aleutians showed upwelling of relatively saline water, poor in oxygen and rich in nutrients. A steady state oxygen model in which the photosynthetic production of oxygen in the euphotic zone is balanced by an upwelling of low-oxygen water yields an upper bound on the vertical velocity of 0.007 cm/s. Examination of various possible driving mechanisms for the upwelling, including winds and entrainment, suggested that the upwelling is driven by subsurface convergence. (Sims - ISWS)
W76-09585

MODELING THE CHESAPEAKE BAY AND TRIBUTARIES: A SYNOPSIS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
R. E. Ulanowicz.
Chesapeake Science, Vol. 17, No. 2, p 114-122, June 1976. 49 ref.

Descriptors: *Chesapeake Bay, *Model studies, *Estuaries, *Tributaries, Hydraulic models, Mathematical models, Computer models, Reviews, Bays, Rivers, Circulation, Water circulation, Flow, Currents(Water), Pollutants, Path of pollutants, Simulation analysis, Analytical techniques.

The last decade has seen the development and application of a spectrum of physical and numerical hydrographic models of the Chesapeake Bay and its tributaries. The success of the James River Hydraulic Model has initiated the construction of an estuarine hydraulic model of the entire Chesapeake System. Numerical analogues for hydrographic behavior and contaminant dispersion in one-, two-, and three-dimensional model estuaries exist for various regions of the Bay. From an engineering viewpoint, one-dimensional models are sufficiently advanced to be routinely employed in aiding management decisions. Bay investigators are playing leading roles in the development of two- and three-dimensional models of estuarine flows. (Sims-ISWS)
W76-09587

MYXOBACTERIA OF THE MYXOCOCCUS GROUP AS INDIRECT INDICATORS OF FECAL MATTER IN SURFACE WATER: 1. COMMUNICATION, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W76-09591

INTERSTITIAL PROTOZOA AND ALGAE OF LOUISIANA SALT MARSHES,
Tulane Univ., New Orleans, La. Newcomb Coll.
For primary bibliographic entry see Field 5C.
W76-09593

AN ASSESSMENT OF POSSIBLE POLLUTION EFFECTS OVER A CENTURY OF THE BENTHIC MARINE ALGAE OF CO. DURHAM, ENGLAND,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-09595

CHEMISTRY OF DISSOLVED INORGANIC CARBON IN ESTUARINE AND COASTAL BRACKISH WATERS,
Groningen Rijksuniversiteit (Netherlands). Environmental Isotopes Lab.
W. G. Mook, and B. K. S. Koene.
Estuarine and Coastal Marine Science, Vol. 3, No. 3, p. 325-336, 1975. 7 fig., 18 ref.

Descriptors: *Carbon, *Estuaries, *Brackish water, *Salinity, *Hydrogen ion concentration, Carbonates, Chemical reactions, Carbon dioxide, Bicarbonates, Ions, Alkalinity, Stable isotopes, Mollusks.
Identifiers: Inorganic carbon.

When fresh and sea water are mixed, chemical rearrangement occurs in the dissociation equilibria. The shifts are complex, and the first and second dissociation constants are functions of ion activities which depend on the water's ionic strength and composition. Fresh waters are considered dilute solutions, but the salt content of sea water affects activity coefficients more than is theoretically predicted due to formation of ion pairs and complexes. When fresh and sea waters are mixed, acidity shows a maximum (pH minimum) at a specific mixing ratio. The first and second apparent dissociation constants of carbonic acid increases rapidly with increased salinity, causing a remarkable pH distribution in an estuary. Downstream, instead of gradual continuous increases in pH from fresh water (7.0-7.5) to ocean values (8.2), the pH showed minimal values at low salinities. With high pH fresh water, a sharp decrease was observed at low salinity. Depending on the alkalinity ratio of fresh river water and sea water, estuarine carbonate ion concentrations could remain very low up to relatively high salinities and may affect shell growth of some mollusks. To obtain dissociation constants for brackish waters with low chlorinities, adjustments of data for pure water and sea water are made by mathematical equations. (Buchanan-Davidson--Wisconsin)
W76-09597

UNDERWATER OBSERVATIONS OF GELATINOUS ZOOPLANKTON: SAMPLING PROBLEMS, FEEDING BIOLOGY, LAND BEHAVIOR,
California Univ., Davis. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-09598

ON THE ECOLOGY OF COLLEMBOLA AND ORIBATIDS IN A LANDSEA TRANSITION ZONE (COLLEMBOLA, INSECTA-ORIBATEI, ACARI) (IN GERMAN),
Kiel Univ. (West Germany). Zoologisches Institut.
G. Weigmann.
Z Wiss Zool 186(3/4), p 295-391, 1973.

Descriptors: *Grasslands, Tidal waters, *Soil-water-plant relationships, Salinity, Ecology, Moisture content.
Identifiers: Acari, Collembola, Festuca, Germany, Insecta-oribatei, Orbatids, Protura, Puccinellia, Salt meadows, West Germany, North Sea.

The localities studied are situated along the shore of the North Sea in Schleswig-Holstein (West Germany). Three of these are salt meadows differently influenced by tidal activity. They are compared with salt-free meadows behind and on dikes and with salt meadows in other regions. Specimens (84,000) of 103 spp. were studied: 41 spp. of Collembola, 61 of Oribatid mites and 1 of Protura. The samples were taken monthly during 2 yr. There is a distinct zonation of the fauna, caused by environmental gradients at the shore. Species with similar ecological valence are grouped together. These groups are based on the sensitiveness of the species to overflow by seawater and the salinity and wetness of the soil. The faunal differences between the Puccinellia zone and the lower Festuca zone are caused by different wetness and by tidal influence, not by different salinities. Acidity is similar in all areas and has no influence on the zonation. The abundance of euedaphic Collembola is not correlated to one single environmental factor. Experiments on the resistance against water of different salinities and on osmoregulation of the blood were also carried out.--Copyright 1975, Biological Abstracts, Inc.
W76-09635

SCOPE OF TIDAL POWER FROM INDIAN ESTUARIES,
Irrigation and Power Research Station, Amritsar (India).
G. S. Dillon.
Indian Journal of Power and River Valley Development, Vol. XXV, No. 8, p 245-252, August 1975. 1 fig, 3 tab, 8 ref, append.

Descriptors: *Tidal waters, *Estuaries, Shores, Oceans, Coriolis force, Effects, Flow Sites, Obstruction to flow, Tides.
Identifiers: *Power generation, *India, Geometry, Tidal data, Gulf of Kutch(India), Gulf of Cambay(India).

The traditional sources of power generation, i.e., hydro and thermal, will soon be exploited fully. The development of nuclear power is limited by indigenous availability of nuclear fuel. To meet the keen demand of power, attention needs now to be focussed on non traditional sources of energy--solar and oceanic tides. This paper presents a preliminary review of the phenomenon of tide generation in open seas and its propagation into estuaries. The study also identifies promising sites in the Gulf of Kutch and Gulf of Cambay. Necessity for keeping these sites under observation so as to assess their power potential by harnessing the tides, as done in the case of 'La Rance Tidal Scheme,' has been stressed. (Bell-Cornell)
W76-09639

EFFECTS OF DISCHARGE FROM A DREDGE SPOILS SITE ON CARROLL ISLAND, MARYLAND,
Edgewood Arsenal, Aberdeen Proving Ground, Md. Biomedical Lab.
For primary bibliographic entry see Field 5C.
W76-09647

MICROBIAL DEGRADATION OF MODEL PETROLEUM AT LOW TEMPERATURES,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-09648

SPECIES COMPOSITION AND DIVERSITY OF POLYCHAETES IN THE NEW YORK BIGHT,
Pacific Northwest Environmental Research Lab., Newport, Oreg. Marine Science Center.
For primary bibliographic entry see Field 5C.
W76-09650

ENVIRONMENTAL RESPONSES TO THERMAL DISCHARGES FROM THE CHESTERFIELD STATION, JAMES RIVER, VIRGINIA,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W76-09652

THE MICROBIOLOGICAL POLLUTION OF NORTH SEA AND ENGLISH CHANNEL SHORE, (IN FRENCH),
Institut Pasteur, Lille (France). Laboratoire d'Hydrobiologie.
For primary bibliographic entry see Field 5C.
W76-09657

AN ASSESSMENT OF ESTUARINE AND NEARSHORE MARINE ENVIRONMENTS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 6G.
W76-09665

EVALUATION OF COMBINED APPLICATIONS OF ULTRAFILTRATION AND COMPLEXATION CAPACITY TECHNIQUES TO NATURAL WATERS,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5A.
W76-09690

ACID-IRON WASTE AS A FACTOR AFFECTING THE DISTRIBUTION AND ABUNDANCE OF ZOOPLANKTON IN THE NEW YORK BIGHT: I. LABORATORY STUDIES ON THE EFFECTS OF ACID WASTE ON COPEPODS,
Harvard Univ., Cambridge, Mass. Biological Labs.
For primary bibliographic entry see Field 5C.
W76-09700

DEVELOPMENT OF EDINBURGH'S SEWAGE DISPOSAL SCHEME,
Lothian Regional Council (Scotland).
For primary bibliographic entry see Field 5D.
W76-09707

DIAGNOSTIC MODEL STUDY OF MIXED-LAYER DEPTHS IN THE SUMMER NORTH PACIFIC,
Rand Corp., Santa Monica, Calif.
R. C. Alexander, and J-W. Kim.
Journal of Physical Oceanography, Vol. 6, No. 3, p 293-298, May 1976. 8 fig, 1 tab, 13 ref. ARPA DAHC15-73-C-0181.

Descriptors: *Model studies, *Pacific Ocean, *Oceans, Mathematical models, Temperature, Radiation, Solar radiation, Winds, Mixing, Oceanography, Depth.
Identifiers: *Mixed-layer depths, Mixed layers.

The Kraus-Turner one-dimensional diagnostic model for calculating oceanic mixed layer depths gave realistic results for the summer North Pacific provided the effect of dissipation was appropriately included to limit mixed layer depth, particularly in regions where heating was weak. Sensitivity of the results to the radiation extinction coefficient beta was reduced by the new degrees of freedom provided by dissipation. Mixed-layer depths calculated with the present model over the summer North Pacific were within a factor of 2 of observed depths for reasonable values of beta, background dissipation, and coefficients of order unity. (Sims - ISWS)
W76-09719

THE ROLE OF VERTICAL MOTION IN THE HEAT BUDGET OF THE UPPER NORTHEASTERN PACIFIC OCEAN,
Hawaii Inst. of Geophysics, Honolulu; and Hawaii Univ., Honolulu. Dept. of Oceanography.
W. J. Emery.
Journal of Physical Oceanography, Vol. 6, No. 3, p 299-305, May 1976. 2 fig, 4 tab, 11 ref.

Descriptors: *Oceans, *Pacific Ocean, *Heat budget, Temperature, Thermal properties, Heat flow, Heat transfer, Mathematical studies, Correlation analysis, Heat, Energy, Oceanography.
Identifiers: *Vertical motion.

A study of the heat budget of the upper northeastern Pacific Ocean demonstrated the importance of heat changes due to vertical motion. Bathythermograph observations were used to form time series of monthly average thermal structure at ocean weather station November (30 deg N, 140 deg W) and various 5 deg and 2 deg quadrangles between California and Hawaii. These time series were first used to explore correlations between heat content in a 250 m thick layer and the depth of the 14C isotherm. High negative correlations between these quantities suggested that vertical motion at 250 m, indicated by the fluctuations of the 14C isotherm, must play a significant role in altering the heat content of the upper layer. A heat budget equation was derived that includes the heat changes due to vertical motion. At all test locations, correlations between terms showed that a stronger relationship exists between surface heat exchange and heat content change when the heat changes due to vertical motion are included. The mean square difference between surface heat exchange and heat content change was computed with and without heat changes due to vertical motion. The ratio of these differences showed about a 50% improvement when heat changes due to vertical motion are included. (Sims - ISWS)
W76-09720

PROBABILITY DISTRIBUTIONS OF BREAKING WAVE HEIGHTS EMPHASIZING THE UTILIZATION OF THE JONSWAP SPECTRUM,
Oregon State Univ., Corvallis.
J. H. Nath, and F. L. Ramsey.
Journal of Physical Oceanography, Vol. 6, No. 3, p 316-323, May 1976. 9 fig, 16 ref, 1 append. ONR N00014-67-A-0369-0007.

Descriptors: *Ocean waves, *Waves(Water), *Model studies, *Pacific Ocean, Winds, Weather, Fetch, Storms, Wavelenghs, Mathematical studies, Mathematical models, Oceans, Meteorology, Oceanography.
Identifiers: *Breaking waves, Wave height distributions.

An approximate determination has been made of the probability distribution function for breaking wave heights in the deep ocean. It was necessary to make simplifying assumptions of the joint distribution of wave height and wave period so that a semi-closed mathematical solution could be obtained as an illustration of the total processes that actually occur. These assumptions lead one to a calculation which predicts more and larger breaking waves than those which actually occur. Thus, for the design of structures in the deep ocean which are sensitive to breaking waves, a conservative determination of the probability distribution function is obtained. The distributions can be obtained for any location in the deep ocean given a sufficient history of surface meteorological data on wind speed and fetch. The joint distribution of wind speed and fetch for station PAPA in the North Pacific Ocean proved to be independent of storm duration. Thus, 6 h unit storms were considered to be independent in the computations. (Sims - ISWS)
W76-09721

ON ENTRAINMENT AND DIFFUSION IN A GULF OF MEXICO ANTICYCLONIC RING,
Texas A and M Univ., College Station. Dept. of Oceanography.
J. E. Schmitz, and A. C. Vastano.

Journal of Physical Oceanography, Vol. 6, No. 3, p 399-402, May 1976. 4 fig, 2 tab, 3 ref. ONR N00014-68y0308-0002.

Descriptors: *Water circulation, *Gulf of Mexico, *Model studies, Mathematical models, Circulation, Currents(Water), Temperature, Flow, Diffusion, Entrainment, Gulfs, Oceanography.
Identifiers: *Gulf of Mexico anticyclonic ring, *Gulf Loop Current, *Gulf Stream, Gulf Stream cyclonic ring.

The parametric model used by Schmitz and Vastano (1975) to investigate a Gulf Stream cyclonic ring has been applied to successive observations of a Gulf of Mexico anticyclonic ring. Coefficients for a polynomial representation of the transverse streamfunction were determined for pairs of eddy diffusivity coefficients. Using the minimum least-squares error residual as a criterion, the best flow pattern for the ring occurred for K sub h = 0 sq cm/s. The total transverse transport through the ring was found to be an order of magnitude larger than that found in the Gulf Stream cyclonic ring. (Sims - ISWS)
W76-09723

THE WIND DRIFT AND WAVE BREAKING,
Naval Research Lab., Washington, D.C. Ocean Sciences Div.
J. W. Wright.
Journal of Physical Oceanography, Vol. 6, No. 3, p 402-405, May 1976. 6 fig, 1 tab, 6 ref. NESS NA-756-73.

Descriptors: *Waves(Water), *Winds, *Model studies, Mathematical models, Hydraulic models, Gravity waves, Fluid mechanics, Fetch, Currents(Water), Oceans, Oceanography.
Identifiers: *Wind drift, Wave breaking.

When the wind blows across the water, a highly sheared current develops which extends a few millimeters into the water and amounts, at the surface, to 3-4% of the wind speed. Banner and Phillips have pointed out that the wind drift, as this thin surface current layer is called, may be sufficiently augmented by interaction with the orbital velocity field of the wave that the maximum particle speed may exceed the phase speed and the wave breaks. If a longer gravity wave is also present, the wind drift may be further augmented and the short gravity wave may break prematurely. Both the basic breaking condition and the diminution (straining) of the short gravity waves by longer waves were examined experimentally in wave tanks. It was found that actual wave breaking occurs at substantially higher winds than predicted and that the diminution is substantially less at the higher winds. The observed wind speed dependence of this diminution appears to be contrary to prediction and points to direct coupling between wind and short gravity waves as an important factor in the response of these waves to straning. (Sims - ISWS)
W76-09724

REMOVAL OF DISSOLVED BORON AND SILICON DURING ESTUARINE MIXING OF SEA AND RIVER WATERS,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 2K.
W76-09725

MARINE SOIL POLLUTION AND SELF-PURIFICATION, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5A.
W76-09789

THE HEAVY METAL CONCENTRATIONS IN THE WATERS ALONG THE COAST OF FUKUYAMA, (IN JAPANESE),
Kagoshima Univ. (Japan). Lab of Marine Botany and Environmental Sciences.
For primary bibliographic entry see Field 5A.
W76-09815

BALANIDAE AS POLLUTION INDICATORS IN THE BAY OF GUANABARA, (IN PORTUGUESE),
Instituto Oswaldo Cruz, Rio de Janeiro (Brazil).
For primary bibliographic entry see Field 5A.
W76-09823

WAVE BREAKING IN THE PRESENCE OF WIND DRIFT AND SWELL,
Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
O. M. Phillips, and M. L. Banner.
Available from National Technical Information Service, Springfield, Va 22161 as AD-A012 788, $3.50 in paper copy, $2.25 in microfiche. Reprint, Journal Fluid Mechanics, Vol 66, Part 4, p 625-640, 1974. 8 fig, 1 tab, 7 ref.

Descriptors: *Waves(Water), *Ocean waves, *Winds, *Air-water interfaces, Velocity, Energy gradient, Currents(Water), Fetch, Energy equation.
Identifiers: Wave action, Surface drift.

Wind, blowing over a water surface, induces a thin layer of high vorticity in which the wind stress is supported by molecular viscosity; the magnitude of the surface drift, the velocity difference across the layer, being of the order of 3% of the wind speed. When long waves move across the surface, there is a nonlinear augmentation of the surface drift near the long-wave crests, so that short waves, superimposed on the longer ones, experience an augmented drift in these regions. This is shown to reduce the maximum amplitude that the short waves can attain when they are at the point of incipient breaking. Theoretical estimates of the reduction are compared with measurements in wind-wave tanks by the authors and by Mitsuyasu (1966) in which long mechanically generated waves are superimposed on short waves by increasing the slope of the longer ones at constant wind speed are generally consistent with the predictions of the theory in a variety of cases. (Sinha-OEIS)
W76-09874

ASSESSING POTENTIAL OCEAN POLLUTANTS,
National Academy of Sciences, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-09889

OFFSHORE PETROLEUM AND NEW ENGLAND - A STUDY OF THE REGIONAL ECONOMIC CONSEQUENCES OF POTENTIAL OFFSHORE OIL AND GAS DEVELOPMENT,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
For primary bibliographic entry see Field 6B.
W76-09893

OIL SPILL AND OIL POLLUTION REPORTS, NOVEMBER 1974 - FEBRUARY 1975,
California Univ., Santa Barbara, Marine Science Inst.
For primary bibliographic entry see Field 5A.
W76-09896

DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM, FINAL REPORT,
Aerojet Electrosystems Co., Azusa, Calif.
For primary bibliographic entry see Field 5A.
W76-09898

COASTAL WATER RESEARCH PROJECT. ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 1975,
Southern California Coastal Water Research Project, El Segundo, Calif.
For primary bibliographic entry see Field 5B.
W76-09899

ENGINEERING AND ECOLOGICAL EVALUATION OF ARTIFICIAL-ISLAND DESIGN, RINCON ISLAND, PUNTA GORDA, CALIFORNIA,
Blume (John A.) and Associates Research Div., San Francisco, Calif.
J. M. Keith, and R. E. Skjei.
U. S. Army Corps of Engineers, Coastal Engineering Research Center Technical Memorandum No. 43, March 1974. 76 p, 16 fig, 10 tab, 27 ref, append. Appendix - 'The Biota of Rincon Island,' by Brisby, W. L.; Moorpark Colege, California. DACW72-73-C-0004.

Descriptors: *Environmental effects, *Resources development, Water resources, *Water quality control, Continental Shelf, Islands, Ecology, Assessment, California, Bathymetry, Sediments, Bottom sediments, Biota, Design, Engineering structures.
Identifiers: *Artificial island, Revetments, Causeways, Littoral transport, Rincon Island(CA), Environmental impact.

Rincon Island, Punta Gorda, California, is an offshore island manmade in 1958. It was the first such island to be built with an ocean exposure. The island, located in a depth of about 45 feet, is composed of armor rock and tetrapod revetments enclosing a sand core. A pile-supported cayseway about 2,700 feet along connects the island to the shore. Major findings of an evaluation of the islands performance in the more than 14 years of its existence show: that the revetment has not been damaged by wave attack; that subsidence ranging from about 3 inches to 1.5 feet has occurred, mainly due to the deterioration of some inferior material in the revetment; that littoral transport has been almost unaffected; that adjacent bottom topography shows minor changes; and that a large, thriving community of marine organisms has developed in the environment created by the island. The report includes recommendations for instrumentation to provide measurement of waves and nearby bottom sedimentation. (Sinha - OEIS)
W76-09903

RECOMMENDED PROCEDURE FOR DEVELOPING DEEPWATER PORTS DESIGN CRITERIA,
Coast Guard, Washington, D.C. Office of Marine Environment and Systems.
For primary bibliographic entry see Field 5G.
W76-09907

OPERATIONAL MODEL FOR PREDICTING THE MOVEMENT OF OIL IN CANADIAN NAVIGABLE WATERS,
Canada Centre for inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-09908

EFFECTS OF PETROLEUM POLLUTANTS ON ARCTIC MICROBIAL POPULATIONS,
Louisville Univ., Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-09909

A POST CONSTRUCTION SURVEY OF SEVERAL MANMADE ISLANDS OFF THE COAST OF CALIFORNIA,
Dames and Moore, Los Angeles, Calif.
S. Noble, and R. Dornhelm.
Shore and Beach, Vol 43, No 1, p 21-26, April 1975. 8 fig, 5 ref.

Descriptors: *Environmental effects, Water resources, *Resources development, *California, Continental Shelf, Coasts, Engineering structures, Waves(Water), Littoral, Scour, Barrier islands.
Identifiers: Outer Continental Shelf, *Artificial islands, Coastal processes, Shorelines, Environmental impact, Thums Islands(CA), Island Esther(CA), Rincon Island(CA).

Several offshore island structures have been constructed on the west coast of the United States; they are Thums Islands, Island Esther, and Rincon Island. A description is presented of the impacts these islands have had on coastal processes in their vicinity, and the response of particular structural features to the stresses they have undergone. Of the islands studied, two of the Thums Islands (islands A and C) were the only structures that appeared to have had an effect on the shoreline. Advancement of the shoreline was observed in the wave shadow behind both of these islands. Island Esther and Rincon Island appear to have produced no change in the shoreline. Rincon Island provides clear evidence that an offshore island can be constructed so as not to cause detectable changes in the adjacent shoreline. Island Esther and Rincon Island have both produced changes in the bathymetry in their immediate vicinity. Conclusions concerning scour and accretion at the offshore islands examined in this study are: the changes in bathymetry have been observed to water depths of about 50 feet; the changes observed did not adversely affect the stability of the structure, and the measurable changes in bathymetry were confined to an area within approximately 2 to 3 island diameters of the island's toe. The findings of this study indicate that artificial islands can be designed to withstand the environmental stresses within the specification of the design, and can be located so as to minimize the environmental impact on coastal processes and the shoreline.
W76-09911

AN ENVIRONMENTAL RESEARCH PROGRAM FOR DRILLING IN THE CANADIAN BEAUFORT SEA,
Gulf Oil Canada Ltd., Calgary (Alberta).
For primary bibliographic entry see Field 5G.
W76-09912

ACADEMIC DATA-NEEDS FOR ENVIRONMENTAL ASSESSMENTS OF OFFSHORE TECHNOLOGICAL OPERATIONS,
New York Ocean Science Lab., Montauk.
For primary bibliographic entry see Field 6G.
W76-09914

COAST GUARD'S RESPONSE TO SPILLED OIL,
Coast Guard Reserve, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W76-09915

BOTTOM DEPOSITS OF THE KUBAN DELTAIC LIMANS, (IN RUSSIAN),
Rostov-on-Don State Univ. (USSR).
V. T. Bogucharskov.
Izv Sev-Kavk Nauch Tsentra Vyssh Shk Estestv Nauki. 1, p 100-101, 1974.

Descriptors: *Bottom sediments, *Deltas, Sediment transport, *Sediment discharge, Vegetation, *Salinity.
Identifiers: *Cardium, *Limans, *USSR(Kuban River).

Data are presented on the formation of the sediment discharge in the delta of the Kuban River, which empties into the Azov Sea (USSR) forming the system of deltaic lakes (limans). In the past, the accumulation of river sediments or Cardium valves during the period of salinization of the limans constituted the basis of the bottom sediments. At present, the decay products of vegetation comprise the basis of the bottom deposits. The fractional composition of the surface layer of bottom deposits are given.--Copyright 1975, Biological Abstracts, Inc.
W76-09935

SYMPOSIUM ON MODELING TECHNIQUES, VOLUME I.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 2A.
W76-09941

HYBRID-ELEMENT METHOD FOR WATER WAVES,
Massachusetts Inst. of Tech., Cambridge, Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-09945

LARGE WAVE CHANNEL FOR 'FULL SCALE-MODELING' OF WAVE DYNAMICS IN SURF ZONES,
Technische Hochschule, Hanover (West Germany). Franzius-Institut fuer Grund und Wasserbau.
For primary bibliographic entry see Field 8B.
W76-09946

MODELING OF WIND-WAVES WITH JONSWAP SPECTRA,
Chicago Bridge and Iron Co., Plainfield, Ill. Marine Research and Development.
For primary bibliographic entry see Field 8B.
W76-09948

USE OF MATHEMATICAL MODELS IN THE PALO ALTO MARSHLAND REHABILITATION PROJECT,
Water Resources Engineers, Walnut Creek, Calif.
For primary bibliographic entry see Field 8B.
W76-09949

ESTUARINE ECOLOGIC SIMULATIONS,
Water Resources Engineers, Inc., Austin, Tex.
R. J. Brandes, and F. D. Masch.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 159-178, 1975. 7 fig, 12 ref.

Descriptors: *Model studies, *Estuaries, *Texas, *Gulf of Mexico, Ecology, Mathematical models, Ecosystems, Water quality, Nutrients, Aquatic life, Fish, Aquatic plants, Phytoplankton, Algae, Zooplankton, Estuarine environment.

A numerical technique for simulating the ecological behavior of large, shallow estuaries typical of those along the coast of the Gulf of Mexico was presented. Originally developed to assess the effects of proposed upstream water resource development projects on the existing aquatic ecosystems in Texas estuaries, the ESTECO model has broad application to a variety of problems related to management of coastal waters. The model has been applied to the San Antonio Bay system on the Texas Coast, and calibration of the model has been undertaken to the extent possible using available water quality and biological data. The estuarine ecologic model utilizes a two-dimensional (area-wise) Eulerian mesh of square cells to describe the physical character of a prototype system and to facilitate the model's altrrnating-direction implicit numerical solution scheme. A computational grid composed of one square-mile cells was used for the model of San Antonio Bay. A similarly-structured and compatible tidal hydrodynamics model first must be applied to a bay system to generate a matrix of tidal net flows (across each cell boundary) which in turn, are used in the ecologic model to describe the convective transport of constituents. Hence, the estuarine ecologic model is considered a long-term dynamic model with respect to tidal effects, and its primary application is to those problems requiring simulation of ecologic changes which are likely to accur over a period of several months, or even years, rather than during a given tidal cycle. (See also W76-09941) (Sims - ISWS)
W76-09950

ORGANIC SEDIMENT MODEL FOR WASTEWATER OUTFALL,
Tetra Tech, Inc., Lafayette, Calif.
For primary bibliographic entry see Field 5B.
W76-09951

SIMULATION OF TIDAL HYDRODYNAMICS - MASONBORO INLET,
Water Resources Engineers, Inc., Austin, Tex.
For primary bibliographic entry see Field 8B.
W76-09953

RIVER DELTA COMPUTER SIMULATION MODEL (SIMUDELT),
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
K. K. Shearin, and J. L. Machemehl.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 240-253, 1975. 5 fig, 5 ref.

Descriptors: *Deltas, *Sedimentation, *River flow, *Tides, *Alluvial fans, Interfaces, Sediment load, Diffusion, Computer models, On-site investigations.
Identifiers: *Longshore transport, Tidal fluctuation, Jet flow.

The depth of fresh water is modeled as a sine wave with amplitude of one half the tidal range and period of one tidal cycle. The cycle is partitioned and the discharge evaluated at the midpoint of each subinterval; the sum is taken over one tidal cycle and used as the unit of sediment discharge. The longshore transport is described by a Gaussian distribution with mean of one half the distance from the shoreline to the breaker line. The fraction of the deposited sediment to be transported is calculated from the ordinate of the normal curve; appropriate shifts of sediment are made at the end of each interval of deposition. The functions used to describe the tides and the longshore transport were assumed as examples for modeling. Other functions more descriptive of a given situation could be substituted and treated by the same methods. (See also W76-09941) (Singh - ISWS)
W76-09954

ANISOTROPIC SAND TRANSPORT IN TIDAL INLETS,
Foundation for Ocean Research, San Diego, Calif.
S. L. Costa, and J. D. Isaacs.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 254-273, 1975. 11 fig, 1 tab, 10 ref.

Descriptors: *Inlets(Waterways), *Sediment transport, *Hydraulic models, *Tides, *Computer models, Harbors, Dredging, Hydraulics, Turbulence, Sediment control, Model studies.
Identifiers: *Tidal inlets, Unidirectional secondary flow, Sediment transport theory.

The occurrence of natural flushing action in tidal inlets has long been recognized. The traditional

solutions of dredging or the erection of sediment barriers are expensive, of short term usefulness, and engender a degree of environmental shock. This investigation involved redirecting a small part of the power in tidal flows in a manner as to greatly modify sediment deposition in such inlets. A small unidirectional secondary flow from ocean to bay disproportionately reduces power available to transport sediment into the channel and similarly increases the power available to transport sediment seaward. The results from hydraulic and computer models indicated that small perturbations to the inlet dynamics achieved in this manner have a large non-linear effect on the overall transport of sediments in the channel. The amount of change is much greater than might be expected from such small changes in the tidal flow. Recent studies have indicated that model and field data seem to be governed by the same law relating tidal flow and equilibrium channel geometry. Since these are the primary agents governing the results of our experiments, it may be possible to extend the results to real size harbors. (See also W76-09941) (Singh - ISWS)
W76-09955

MODELING SEDIMENT MOVEMENT FOR MASONBORO INLET,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. A. Sager, and W. C. Seabergh.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 274-293, 1975. 13 fig, 7 ref.

Descriptors: *Model studies, *Inlets(Waterways), *Hydraulic models, *Sedimentation, Estuaries, Coasts, Beaches, Sediments, Sands, Tidal effects, Waves(Water), Ocean waves, Sediment transport, Scour, Erosion, Channels, Jetties, Hydraulics.
Identifiers: *Masonboro Inlet(NC).

As part of a U. S. Army Corps of Engineers research program, the General Investigation of Tidal Inlets, a study of Masonboro Inlet is being conducted in a distorted scale, fixed-bed model at the U. S. Army Engineer Waterways Experiment Station in Vicksburg Mississippi. The study involves an examination of fixed bed modeling techniques for inlets. One phase of the Masonboro Inlet study is to determine methods of simulating sand movement in and around the inlet. Effective procedures for predicting sand movement would provide a valuable aid in considering the effects of planned improvements to an inlet. Masonboro Inlet is a naturally occurring entrance through a sandy barrier beach along the North Carolina coast. It has a single weir-type jetty constructed in 1965-1966 with a deposition basin dredged adjacent to the weir and a navigation channel dredged through the ocean bar. The project functioned effectively for a year, then the channel relocated near the jetty and cut through the deposition basin. In 1969, velocities, tidal heights, and other data were collected from the prototype in order to verify a fixed-bed model. After hydraulic verification, the model was verified for shoaling patterns. The shoaling trends were verified for the 1969-1971 period using a light-weight plastic cube, 3mm on a side, and with a specific gravity of 1.18. After verification the model bed was molded to conform to the 1964 preproject conditions and a test was made to see if the model would predict the shoaling trends that occurred in the prototype after construction of the project. Results of the model tests compared to prototype data showed a good agreement between the model and prototype. (See also W76-09941) (Sims-ISWS)
W76-09956

MASONBORO INLET FIXED-BED MODEL EVALUATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W76-09957

PRINCIPLE OF MANAGEMENT OF DEGENERATED INLETS AND ESTUARIES,
Laval Univ., Quebec. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-09958

TEMPERATURE PREDICTIONS FOR OFFSHORE POWER PLANTS,
Massachusetts Inst. of Tech., Cambridge. Energy Lab.
For primary bibliographic entry see Field 5B.
W76-09960

SAMPLING NETWORK DESIGN FOR DISPERSION VERIFICATION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-09961

FORECASTS FOR THE SACREMENTO RIVER SYSTEM,
National Weather Service, Sacramento, Calif. River Forecast Center.
For primary bibliographic entry see Field 2E.
W76-09967

SYSTEMS MODELING OF STRATIFIED FLUIDS,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Center.
For primary bibliographic entry see Field 8B.
W76-09976

MODELING OF THREE-DIMENSIONAL FLOWS IN ESTUARIES,
Rand Corp., Santa Monica, Calif.
J. J. Leendertse, and S-K. Liu.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 625-642, 1975. 9 fig, 11 ref. OWRT C-4261(No. 9040) (3).

Descriptors: *Model studies, *Estuaries, *Flow, *Chesapeake Bay, Tides, Storm surge, Circulation, Water circulation, Bays, Mathematical models, Turbulent flow, Hydraulics.
Identifiers: *San Francisco Bay, *Three-dimensional flows, Modeling techniques, Boundary conditions.

The paper described the computational principles of simulating three-dimensional flows in estuaries, bays, and coastal seas in which nonisotropic density conditions may exist. Numerical integration of the finite difference equations for motion, continuity, and for the transport of salt and heat were used. With this model, the computed salinity and temperature distributions were coupled to the flow computation by a nonlinear equation of state. An approximation for the sub-gridscale effect was introduced by use of mass heat and momentum exchange coefficients. The vertical exchanges for stable or unstable vertical stratification were estimated according to the local Richardson number. (See also W76-09941) (Sims - ISWS)
W76-09977

RESULTS OF SALINITY TESTS ON THE SAN FRANCISCO BAY-DELTA HYDRAULIC MODEL,
Army Engineer District, San Francisco, Calif.
M. A. Blank.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 663-674, 1975. 3 fig, 6 ref, 1 append.

Descriptors: *Model studies, *Estuaries, *Deltas, *California, Tidal marshes, Rivers, Bays, Coasts, Coastal plains, Salinity, Water quality, Hydraulic models, Sampling, Data processing.
Identifiers: *San Francisco Bay, *Sacramento-San Joaquin Delta(Calif).

As part of the San Francisco Bay and Sacramento-San Joaquin Delta Water Quality and Waste Disposal Investigation of the Corps of Engineers, U.S. Army Engineer District, San Francisco, hydraulic model tests were conducted at the Corps' fixed bed hydraulic (physical) model in Sausalito, California. These tests included: verification for tidal elevations, velocities and salinities; model sensitivity; base and plan conditions. Steady state tests were found satisfactory for measuring tidal elevations and velocities. Dynamic tests were required to obtain salinity results for comparison of base and plan conditions. The specific problem addressed was the effect that channel deepening would have on salinity at selected stations in the estuarine system. While in general deepening of navigation channels increased salinities, there were cases where deepening of the upper reaches of the channel caused small changes in salinity throughtout the system. It may be that the location of a critical mixing zone determines the influence of channel deepening on salinities. Regardless of what theories are used to explain phenomena the model test results indicated what will occur in the prototype for each of the plans tested. Results could then be used by specialist to determine the impact on the estuarine environment. (See also W76-09941) (Sims - ISWS)
W76-09978

EXPERIENCE WITH A SMALL SCALE, HIGHLY DISTORTED FIXED BED MODEL OF THE LAGO MARACAIBO ESTUARY,
Laboratorio National de Hidraulica, Caracas (Venezuela).
J. Brezina.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 675-689, 1975. 9 fig.

Descriptors: *Model studies, *Hydraulic models, *Estuaries, *Tidal waters, Tides, Bays, Tidal effects, Water circulation, Bodies of water, Lakes, Shoals, Roughness(Hydraulic), Saline water intrusion, Hydraulics.
Identifiers: *Lago Maracaibo estuary(Venezuela), *Venezuela.

The construction of a 13.50 m deep navigation channel through the shallow parts of the Gulf of Venezuela and Lago Maracaibo estuary was completed in 1963. The channel was built principally for the tankers which are used to transport crude oil from the fields located in the land enclosed body of water, commonly called Lago de Maracaibo. The field surveys made periodically after the channel was built have shown an increase in the salinity of the Lago de Maracaibo and the formation of shoals in various parts of the channel. To control the shoaling it was necessary to dredge the channel frequently. This operation, which later became continuous, required heavy financing for the maintenance of the channel. In 1968 the situation in the estuary of the Lago de Maracaibo was critically analyzed. It was concluded that the hydrodynamics of the estuary was not well understood, mainly because of limited field data, inadequate to shed light upon the highly complicated condition of the estuary. A 1:100 in vertical and 1:6000 in horizontal fixed bed model of the Lago de Maracaibo estuary reproduced adequately the tidal current patterns which, as it is believed,

hardly could be found by other means under the given condition. The results obtained from the tests have shown that the tidal current patterns are highly complicated and thus any intervention in the existing hydraulic conditions should be considered very carefully. (See also W76-09941) (Sims - ISWS)
W76-09979

HYDRODYNAMIC TRANSPORT PHENOMENA IN ESTUARIES AND COASTAL WATERS: SCOPE OF MATHEMATICAL MODELS,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 5B.
W76-09980

APPLICATION OF WATER QUALITY MODELS TO FINGER FILL CANALS,
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5B.
W76-09981

RIVER AND ESTUARY MODELING WITH THE SIVA SYSTEM,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Centre.
For primary bibliographic entry see Field 2A.
W76-09982

HYDRODYNAMIC AND MATERIAL TRANSPORT MODEL FOR MOBILE BAY, ALABAMA,
Alabama University, University. Department of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-09983

APPLICATION OF PHYSICAL TIDAL MODELS IN HARBOR AND MARINA DESIGN,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-09984

QUANTITATIVE ASPECT OF THE PHYTOPLANKTON OF THE BAY DU LEVRIER (MAURITANIA), (IN FRENCH),
Museum National d'Histoire Naturelle, Paris (France). Laboratoire des Peches Outre-Mer.
For primary bibliographic entry see Field 5C.
W76-09987

THE ERADICATION OF THE SEAWEED SARGASSUM MUTICUM FROM BRITAIN,
Portsmouth Polytechnic (England). Dept of Biological Sciences.
For primary bibliographic entry see Field 5G.
W76-09989

WATER TRANSPORT IN THE SILL AREA OF BALSFJORD NORTH NORWAY, DURING VERNAL MELTWATER DISCHARGE,
Tromsoe Univ. (Norway). Inst. of Biology and Geology.
S. Skreslet.
Astarte. 6(1), p 1-8, 1973.

Descriptors: *Melt water, *Melting, *Fjords, Europe, Tidal waters, Bathythermograph, *Water temperature.
Identifiers: *Norway(Balsfjord), Periodicity, Sill, Vernal meltwater discharge.

From May to July 1971, Aanderaa recorders and a bathythermograph, which was mounted in a sledge, were used to record changes in current and temperature at the bottom inside the sill. Coastal water flowing into the area during high tide was found to restrict surface outflow, especially at spring tides. It also suppressed the basin water during high tide, and probably induced a standing tidal wave at the boundary between the basin water and the upper layers. The water movements caused large-scale temperature variations along the bottom profile. During early July, at both 30 and 39 m depth, short-period temperature variations developed, while variations with tidal periodicity vanished. This was probably related to maximum freshwater discharge.--Copyright 1974, Biological Abstracts, Inc.
W76-09999

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

NEW TECHNOLOGIES IN WATER PURIFICATION AND THEIR APPLICATION TO ARID LANDS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
R. F. Probstein.
In: Symposium on Arid Zone Development: Potentialities and Problems, October 23-25, 1975, Boston. 18 p, 4 fig, 1 tab, 6 ref.

Descriptors: *Arid lands, *Brackish water, *Water purification, *Desalination, *Water quality, Water resources development, Membrane processes, Electrodialysis, Ion exchange, Reverse osmosis, Freezing, Vapor compression distillation, Evaporation, Economic efficiency, Arizona, Groundwater, Technology, Water supply.

New water purification technologies, especially those appropriate for treating brackish waters, are described. Various desalting techniques are analyzed for range of usefulness and economic viability, including ion exchange, electrodialysis, reverse osmosis, freezing, and evaporation. Evaporation and freezing are most suitable for desalinating seawater, but these systems are complex and costly. Ion exchange, electrodialysis and reverse osmosis are best for purifying brackish waters, being simple and less expensive operations. Reverse osmosis involves a pressure driven membrane process which is a viable means of purification for municipal and industrial water needs in arid regions but not yet for general large-scale agriculture. The technique is most advantageous when there are high levels of dissolved solids and where mechanical power is a desired energy source. Ion exchange also uses a membrane and works best when dissolved solids content is relatively low and a simple operation is desired. Worldwide brackish groundwater supply locations, quantities and quality are described, with details given of U.S. studies. (Jahns-Arizona)
W76-09481

ON THE CAPACITY-EXPANSION OF DESALINATION PLANTS AND STORAGE TANKS,
California Univ., Davis. Dept. of Water Science and Engineering.
H. N. Rajhi, and M. A. Marino.
Water Resources Bulletin, Vol. 12, No. 3, p 481-500, June 1976. 1 fig, 4 tab, 17 ref.

Descriptors: *Desalination plants, *Storage tanks, *Optimization, *Economics, Water supply, *Size, Economies of scale, Population, Water demand, Interest rates, Computer programs, Constraints, Municipal water, Equations, Nonlinear programming, Sea water, Capital costs, Operating costs, Planning, Algorithms, Mathematical models.
Identifiers: *Capacity expansion, *Cost minimization, Coastal cities.

A mathematical programming model is structured to find the optimal time and capacity expansion path of desalination plants and storage tanks for a hypothetical community which depends on desalination as its sole, or major, water supply source. The objective is to determine the least costly combination of sizes and times of installation (of both desalting plants and storage tanks) which can meet a rising water demand over a finite planning horizon. The optimality criterion used in the model is based on two major economic elements: the economies of scale inherent in such facilities and the time-value of money represented by the interest rate, the former favoring large capacities and the latter small capacities. The model is applied using three population growth patterns and two interest rates. The water demand components for every year in the planning period are computed using empirical formulas which are based on population and other basic data. The model is solved for each of the above cases with the aid of a nonlinear programming computer package, based on the method of feasible conjugate directions. The results clearly reflect the balance between the economies of scale and the time-value of money under every demand growth function. (Bell-Cornell)
W76-09618

REVERSE OSMOSIS -- CAN IT REPLACE DISTILLATION,
For primary bibliographic entry see Field 5D.
W76-09667

THE DESERT WAR ON POLLUTION,
For primary bibliographic entry see Field 5D.
W76-09711

INVESTMENT SEQUENCING, ALLOCATION, AND LEARNING IN THE DESIGN OF WATER RESOURCES SYSTEMS: AN EMPIRICAL APPLICATION,
Harvard Univ., Boston, Mass. Graduate School of Business Administration.
For primary bibliographic entry see Field 6A.
W76-09846

SUPPORTED SEMI-PERMEABLE MEMBRANES,
Daicel Ltd., Osaka (Japan). (Assignee).
K. Ishii, and S. Konomi.
U.S. Patent No. 3,950,255, 3 p, 5 ref; Official Gazette of the United States Patent Office, Vol 945, No 2, p 826, April 13, 1976.

Descriptors: *Patents, *Reverse osmosis, *Membranes, *Semipermeable membranes, Membrane processes, Separation techniques, Water purification, *Desalination processes, Water quality control, Water treatment, *Waste water treatment, Strength of materials.
Identifiers: Membrane support.

Supported semi-permeable membranes are prepared by coating a membrane-forming solution directly on a membrane support. The membrane support is a woven fabric selected from the group consisting of: a woven fabric made of mixed yarns and formed by employing as a part of the weft and/or warp yarns a yarn composed of a component soluble in a solvent used for forming the membrane-forming solution; a woven fabric composed of a blended yarn including as one blend component fibers composed of a component soluble in a solvent used for forming the membrane-forming solution; and a woven fabric having its surface coated with a polymer soluble in a solvent used for forming the membrane-forming solution. The supported semi-permeable prepared according to the process of this invention has a much improved resistance to repetitions of compression and pressure reduction, and simultaneously, the general mechanical strength is increased. (Sinha - OEIS)
W76-09863

SEMIPERMEABLE MEMBRANE AND PROCESS FOR THE PREPARATION THEREOF,
Daicel Ltd., Osaka (Japan). (Assignee).
K. Ishii, and Z. Honda.
U.S. Patent No. 3,950,257, 8 p, 2 fig, 4 tab, 13 ref; Official Gazette of the United States Patent Office, Vol 945, No 2, p 827, April 13, 1976.

Descriptors: *Patents, *Reverse osmosis, *Membranes, *Semipermeable membranes, Membrane processes, Filtration, Separation techniques, Water purification, Desalination processes, Water quality control, *Waste water treatment, Polymers, Organic compounds.

A process for preparing a semipermeable membrane for ultrafiltration is characterized in that a copolymer of 90 to 60 molar percent of acrylonitrile and 40 to 10 molar percent of at least one non-electrolytic, water-soluble monomer is dissolved in a solvent, and the solution is spread upon a surface such as a glass or cloth surface to form a film and then the film is immersed in water to form a semipermeable membrane. The copolymer of acrylonitrile and the non-electrolytic, water-soluble monomer can be prepared easily by the mass polymerization process. (Sinha - OEIS)
W76-09864

METHOD AND APPARATUS FOR CONVERTING SALINE WATER TO FRESH WATER,
P. S. Roller.
U.S. Patent No. 3,951,752, 6 p, 1 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1331, April 20, 1976.

Descriptors: *Waste water treatment, *Patents, *Saline water, *Sea water, *Brackish water, *Desalination, *Water purification, Desalination apparatus, Scaling, Demineralization, Separation techniques, Condensation, Condensers, Flash distillation.

Saline water, typically sea water or brackish water, after deaeration and deoxygenation is preheated, then further heated by steam condensing with the preheated saline water. By the further heating, bicarbonates are thermally decomposed, forming carbon dioxide, while scale compounds, comprising magnesium hydroxide, anhydrite and minor compounds containing silica, iron, alumina, phosphate, etc., are thermally precipitated. Some of the steam is uncondensed and issues from the further heated saline water with included, evolved carbon dioxide. It is condensed in pre-heating saline water; evolved carbon dioxide is separated from the condensate and recycled to the saline water to prevent alkaline scale in preheating, while condensate is combined with the further heated saline water, forming post-thermal saline water. This is flash vaporized while cooling and the steam is regenerated by compressing the flashed vapors. Cooled, post-thermal saline water is evaporated preferably in a vapor compression evaporator to form fresh water and saline water residuum. (Sinha-OEIS)
W76-09871

METHOD AND APPARATUS FOR THE CONVERSION OF AN AQUEOUS SCALE-FORMED LIQUID,
P. S. Roller.
U.S. Patent No. 3,951,753, 10 p, 11 fig, 2 tab, 11 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1331, April 20, 1976.

Descriptors: *Waste water treatment, *Patents, Saline water, *Sea water, *Brackish water, *Scaling, *Desalination, Water purification, Water treatment, Desalination apparatus, Demineralization, Separation techniques, Evaporation, Condensation, Condensers, Flash distillation, Carbon dioxide, *Corrosion.

The invention relates to converting an aqueous scale-forming liquid to distillate and liquid residuum, and in particular to processing the liquid to avoid scale and minimize corrosion while evaporating it to a high degree. Saline water is preheated by the hot discharges of a vapor compression evaporator, forming distillate and concentrated brine. Carbon dioxide that has been recycled to saline water prevents alkaline scale during the preheat. The saline water is thence further heated by steam which is condensed in it; scale compounds are precipitated and carbon dioxide formed and expelled for recycle. Mother liquor which is separated is flash vaporized, forming cooled mother liquor and vapor. The mother liquor is further cooled while preheating saline water, and is then evaporated. The vapor is compressed to form steam for use in the further heating. (Sinha-OEIS)
W76-09872

PREPARATION OF REVERSE OSMOSIS MEMBRANES BY COMPLETE EVAPORATION OF THE SOLVENT SYSTEM,
Dept. of the Interior, Washington, D. C.
R. E. Kesting.
Patent Application No. 401,003, September 26, 1973. 22 p, 2 tab.

Descriptors: *Patents, *Desalination, *Separation techniques, *Waste water treatment, *Water purification, Membranes, Reverse osmosis, Membrane processes, Water quality control, Seawater, Brackish water, Acid mine water.
Identifiers: Asymmetric reverse osmosis membranes, Cellulose acetate.

An asymmetric reverse osmosis membrane can be prepared by forming a dilute solution of cellulose acetate in a solvent system consisting of a volatile true solvent for the polymer and at least one non-solvent which acts as a pore-forming material. The solution is cast into a thin film and allowed to dry completely. The membranes formed by this process are wet-dry reversible, i.e., they can be wet and dried numerous times without any special treatments and without any impairment of the membrane properties. Asymmetric cellulose acetate membranes consist of two separate layers: a thin dense skin layer which is the effective resistance to solute transport and a thick porous substratum which acts as a mechanical support for the skin but exhibits little or no resistance to the transport of either solute or solvent. The porous support layer consists of an open cell structure which freely permits permeation through the channel in the cells. (Sinha-OEIS)
W76-09876

REVERSE OSMOSIS PROCESS USING CROSS-LINKED AROMATIC POLYAMIDE MEMBRANES,
Department of the Interior, Washington, D. C.
R. McKinney, Jr., and W. L. Hofferbert.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-241 675, $3.50 in paper copy, $2.25 in microfiche. U. S. Patent Application, Serial Number 616,441, Filed February 13, 1976. 15 p, 1 tab.

Descriptors: *Patents, *Reverse osmosis, *Membranes, *Waste water treatment, *Desalination, *Water quality control, Saline water, Chemical reactions, Irradiation.
Identifiers: *Crosslinked aromatic polyamide membranes, Ionic crosslinking.

Reverse osmosis membranes of improved flux or flux stability are prepared by crosslinking aromatic polyamide membranes. Crosslinking may be achieved by reaction with crosslinking reagents such as aldehydes, polyamines, polycarboxylic acids, polyisocyanates, oxidizing agents, peroxides, etc. Optimum proportions of crosslinking reagent and catalyst, as well as temperature and reaction time, will vary considerably with the specific polyamide and the specific crosslinking reagent and best determined experimentally. A second means of achieving crosslinking is by means of irradiation. According to this method, the finished, i.e., coagulated and extracted, membrane is exposed to radiation such as ultra-violet, x-rays, gamma rays, and high energy electrons, with the preferred form of radiation being gamma radiation. In addition, the irradiation may be carried out in the presence of monomers capable of undergoing free radical polymerization. A particularly effective means of crosslinking has been found to be that of ionic crosslinking. According to this procedure, a hydrophilic or polar group is introduced into the linear polyamide chain by including reactants containing the polar group in preparation of the linear polyamide. Suitable polar groups include carboxyl, amine, amic acid, etc. Ionic crosslinking results in substantial improvement in flux stability, as well as flux. (Sinha-OEIS)
W76-09877

3B. Water Yield Improvement

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: PENN STATE EXPERIMENTAL WATERSHEDS,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 4D.
W76-09463

WATER CONSERVATION IN ARID-ZONE SOILS,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
D. Hillel.
In: Symposium on Arid Zone Development: Potentialities and Problems, October 23-25, 1975, Boston. 18 p, 6 fig, 1 tab, 12 ref.

Descriptors: *Water conservation, *Evaporation control, *Induced infiltration, *Soil treatment, *Chemcontrol, Infiltration, Arid lands, Soil moisture, Soil erosion, Mulching, Wettability, Rainfall-runoff relationships, Capillary conductivity, Runoff, Absorption.

A new method is described and analyzed for treating the soil surface mechanically and chemically to increase water absorption and retention. The method, which may alleviate drought conditions and increase usable cropland in semiarid regions, involves spraying hydrophobic chemicals to waterproof surface-zone soil clods, creating a cover (or 'mulch') of dry clods. Hydrophobic agents prevent clods from slaking-down in water or clogging surface cavities, thereby helping to maintain a high infiltration rate for maximal rain absorption. Other benefits include prevention of runoff, scouring, and erosion due to intense rainfall; excess water can be held temporarily in the inter-clod cavities of the surface-zone for eventual infiltration. This process is even more valuable during dry spells in semiarid and arid regions because it inhibits capillary conduction from the underlying moist soil; moisture can escape only through relatively slow vapor diffusion. Effects on runoff, evaporation, and crop seed germination are described. A mechanistic numerical simulation model is developed to evaluate the dynamic balance and storage of soil moisture through repeated cycles of rain and evaporation. (Jahns-Arizona)
W76-09478

THE OVER-EXPLOITATION OF GROUNDWATER RESOURCES IN DRY REGIONS,
Hebrew Univ., Jerusalem (Israel). Graduate School of Applied Science and Technology.
For primary bibliographic entry see Field 4B.
W76-09479

MICRO-CLIMATE EFFECTS ON WATER USE EFFICIENCY BY PLANTS IN AN ARID CLIMATE,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
M. Fuchs.
In: Symposium on Arid Zone Development: Potentialities and Problems, October 23-25, 1975, Boston. 15 p, 6 fig, 19 ref.

Descriptors: *Microclimatology, *Canopy, *Arid climates, *Transpiration control, *Water utilization, *Xerophytes, Photosynthesis, Stomata, Drought tolerance, Solar radiation, Plant physiology, Plant groupings.

This research describes how microclimate changes due to physical and physiological characteristics of the plant canopy affect the transpirational water loss, productivity, and water use efficiency of plant communities. Equations demonstrate that a plant community creates its own specific microclimate according to the radiation balance, which depends upon the geometrical properties and density of the foliage. Stomatal resistance modifications cause further adjustment of the canopy's heat budget, and consequently of the microclimate. Transpiration is most controlled at the low end of the stomatal resistance scale, especially for plants with horizontal foliage. Transpiration flux is barely influenced by increased foliage density of the horizontal canopy, proving it to be best suited for drought conditions. Randomly inclined and vertical canopies involve rapid transpiration increases with foliage density, and stomatal control of transpiration becomes largely ineffective. Dense vegetation of these types in an arid climate requires irrigation, and natural survival of such canopies depends on reduced leaf area index. Plants with a C-4 photosynthetic mechanism appear to use more efficiently the high insolation of an arid environment. Water use efficiency is lower in C-3 plants; efficiency for C-4 plants increases systematically with stomatal resistance for all canopy structures and densities, indicating the highest efficiency is reached when plants are water stressed. (Jahns-Arizona)
W76-09480

SIOUX FALLS RESTORES FOUR WELLS WITH COLLECTOR PIPE,
Sioux Falls Water Dept. S. Dak.
D. Moberly.
Op Flow, Vol. 2, No. 3, p. 1, 7, March, 1976, 6 fig.

Descriptors: *Water wells, *Maintenance, *Estimated costs, *Cost comparisons, *South Dakota.
Identifiers: *Ranney horizontal collector well, *Production decline, *Rejuvenating techniques, *Hydraulic blasting unit, Drastic cost reduction.

The Sioux Falls Water Department encounted the problem of rejuvenating four Ranney horizontal collector wells which had declined in production 60 percent from their original capacity of 1,400 gallons per minute. An informal estimate of $17,000 for one well was suggested by a well-cleaning contractor. The well-field foreman found that he could fabricate a hydraulic 'blasting unit' for less than $10,000 using an air compressor, a submersible pump and 120 feet of steel pipe with threaded connections. The blasting unit was jacked into the collector pipe. A shot of compressed air and water was jetted into the pipe to loosen the fine sand that had accumulated around it. The pressure was released with quick-acting gate valves and the fine material was flushed back through the unit into the well caisson. The same procedure was followed in each of the collector pipes. When completed, the rejuvenated well produced in excess of 1,400 gallons per minute. When this process was refined, the job took less than two weeks with a cost of $3,000 per well. (Heiss-NWWA)
W76-09510

INFLUENCE OF HYDRAULIC TROUGH AND LATERAL JOINTS ON THE GROUNDWATER POTENTIAL OF THE MASSIVE TRAP UNIT AT TANORIA IN SHAJAPUR DISTRICT (MP),
Central Ground water Board, Nagpur (India).
For primary bibliographic entry see Field 4B.
W76-09614

INVESTIGATIONS INTO THE YIELD OF AN EXISTING SURFACE RESERVOIR AND AQUIFER SYSTEM,
Lancashire River Authority (England).
P. D. Walsh.
*Water yield, *Reservoirs, *Aquifers, *Surface waters, Water storage, Water distribution(Applied), Water supply, Simulation analysis, Reliability, Size, Operations, Monthly, Failures, Systems analysis.
Identifiers: *England.

Stocks reservoir and the Fylde Bunter sandstone aquifer of North-West England have been used conjunctively for public water supply for some years. A description has been given of early investigations into its operation. Engineering studies have shown that the capacity of the reservoir may be increased, and detailed studies using a digital model to examine the drawdown which would result from various demand patterns on the aquifer have shown that a maximum abstraction rate of 215x10 cu m/cu/day from the aquifer may be sustained over short periods subject to certain limitations for periods of 60, 90 and 180 days and an abstraction of not more than 29,150 10 cu m cu over 1 year and an average withdrawal over 3 years not greater than the average recharge rate assessed at 50.8x10 cu m cu/days. It is shown that the use of monthly data to size the reservoir may underestimate the storage requirement by 15% for a 2% probability of failure, which is shown to be equivalent to a Deficit Day Index (Storage) of 0.06% when using a 6-day period between operating decisions. Using a control curve to determine the rate of abstraction from the reservoir, enables a very high proportion of the reservoir inflow to be taken into supply and reduces the use of the aquifer. (Bell-Cornell)
W76-09631

GRAVITY GEOPHYSICS FOR GROUNDWATER EXPLORATION IN GLACIATED AREAS,
Michigan State University, East Lansing. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W76-09758

THE EFFECT OF SILICON OILS ON THE WATER LOSS OF HORDEUM VULGARE L, (IN GERMAN),
Leipzig Univ. (East Germany). Bereich Pflanzenphysiologische Mikrobiologie.
I. Frommhold.
Biol Zentralbl. 94(1), p 63-74, 1975.

Descriptors: *Antitranspirants, Oil, *Barley, *Water loss, Soil water, Water supply, Sprays, Transpiration control.
Identifiers: *Silicon oils.

Several silicon oils were investigated in order to test their usefulness for application as antitranspirants. The water loss of barley was diminished by spraying with Silicon spray 50. When the soil water supply was restricted, the water loss of the treated plants decreased for several days. The production of dry matter was not influenced. Silicon spray 50 may be considered an antitranspirant.--Copyright 1975, Biological Abstracts, Inc.
W76-09806

3C. Use Of Water Of Impaired Quality

WATER UTILIZATION AND SOIL SALINITY: CONTROL IN ARID ZONE AGRICULTURE,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
E. Bresler.
In: Symposium on Arid Zone Development: Potentialities and Problems, October 23-25, 1975, Boston. 20 p, 7 fig, 25 ref.

Descriptors: *Arid lands, *Saline soils, *Water management(Applied), *Saline water, *Desalination, Irrigation effects, Soil-water-plant relationships, Crop response, Salt tolerance, Surface irrigation, Water quality, Crop production, Soil management, Cost analysis, Computer models, Leaching.
Identifiers: *Trickle irrigation, *Soil desalination.

The only effective method for soil desalinization in arid zones is the application of irrigation water exceeding crop requirements for optimum yield. Under certain arid conditions, irrigation water may be better used for changing the soil-water-salt regime instead of leaching. When the arid soil solution is derived from irrigation water salinity, salt concentrations in the soil solution are always greater than or equal to that of the water used. Permanent irrigation causes increased soil solution concentration regardless of water quality; additionally, irrigation water quality tends to deteriorate, necessitating the use of poorer quality water for irrigation and soil salinity control. The acceptable soil salinity level is basically determined by crop sensitivity. Growth reduction in most crops is controlled primarily by the total salt concentration of the soil solution. Effects on plant growth and crop yield are described, along with the dynamics of water and salt in irrigated soils. The short-run and long-run implications of water utilization for soil salinity control are also discussed, including those of reclamation of saline soils by leaching. (Jahns-Arizona)
W76-09482

WATER SYSTEM BEHAVIOR: DETERMINANTS IN AN ARID REGION,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 4A.
W76-09483

EFFECTS OF FLOODING AND OF IRRIGATION WATER SALINITY ON EUCALYPTUS CAMALDULENSIS DEHN. FROM THREE SEED SOURCES,
Volcani Inst. of Agricultural Research, Ilanot (Israel). Forestry Div.
R. Karschon, and Y. Zohar.
Leaflet No. 54, November, 1975 (presented at the Physiological Genetics Conference, Edinburgh, July 13-21, 1975). 7 p, 3 fig, 1 tab, 11 ref.

Descriptors: *Plant growth, *Irrigation effects, *Salt tolerance, *Trees, *Provenance, *Australia, Water management(Applied), Root development, *Flooding, Saline water, Salinity.
Identifiers: *Eucalyptus camaldulensis.

Differences in flooding and salinity tolerance in Eucalyptus camaldulensis appear related to contrasting ecological conditions at the seed source. This study of flooding and irrigation water salinity effects on the plant in three Australian locations revealed a high salinity tolerance for the Lake Albacutya, Victoria, population. After one year, provenance 6845 in that dry lake location had increased leaf size and dry weights of stem, leaves and roots; in contrast to the other seed sources tested, taproots were well-developed with few adventitious roots floating near the water surface. Irrigation for one year with water containing up to

4,500 ppm NaCl did not markedly impair growth, but flooding for 2 or 4 months with water having 3,000 and 15,000 ppm, respectively, caused growth reduction. Provenance 6869 trees along the levee banks of the Katherine River tolerate seasonal variations in stream level but are less adapted to prolonged anerobic conditions and exposure to salinity. Provenance 8409 trees from around Wyndham, W. A., were even less salt-tolerant although their tapwater flooding tolerance was similar to that of the Katherine trees. Flooding with non-saline water for 4 months is tolerated almost equally by the three seed sources, suggesting it may be a species trait. (Jahns-Arizona)
W76-09664

CONTRIBUTION OF SALTS TO THE WATER POTENTIAL OF WOODY PLANTS,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
A. Wallace, and G. E. Kleinkopf.
Plant Sci Lett. 3(4), p 251-257, 1974.

Descriptors: *Salts, *California, Arid lands, Plant groupings, *Halophytes, Leaves, Cations, Brush, *Salt tolerance, Plant growth.
Identifiers: *Atriplex-Canescens, *Atriplex-Confertifolia, Krameria-Parvifolia, Larrea-Tridentata, Nonhalophytes, Plants, Potential, Salts, Water, Woody, *Water potential(Plants), Mojave Desert(Calif), Woody plants.

Water potentials of a wide variety of desert and nondesert plant species grown in a glasshouse were measured with a pressure bomb and compared with cation concentrations in leaves. Only part of the variation in water potential among all the species was due to salt present in plants (as measured as meq total cations or as % Cl), whereas most of the water potential within some halophyte species was due to the salt present in the plants. Water potentials of 2 Atriplex spp. (A. canescens, A. confertifolia) which are halophytes decreased considerably with increased applications of NaCl. For 2 of the most successful nonhalophyte species in the Northern Mojave Desert (California), (Larrea tridentata and Krameria parvifolia) their low negative water potentials were not caused by their cation concentration which are relatively low, but by unknown factors associated with resistance to water loss.--Copyright 1975, Biological Abstracts, Inc.
W76-09691

EFFECT OF WATER QUALITY AND MANAGEMENT PRACTICES ON SOME CHEMICAL PROPERTIES OF SOILS,
West Pakistan Agricultural Univ., Lyallpur. Dept. of Soil Sciences.
R. A. Khalid, S. Muhammed, and A. K. Hashmi.
Pak J Sci Res. 24(1/2), p 43-49, 1972.

Descriptors: *Soil chemical properties, Water quality, Irrigation water, Wheat, Clays, Leaching, Soils, *Salt tolerance.
Identifiers: Alfalfa, Pakistan.

An experiment was conducted on 3 soils packed uniformly in cement pipes to study the effect of applying inferior quality irrigation water over and above the crop requirement. Wheat and alfalfa were grown as a mixture. The salt accumulation decreased as the amount of water applied at irrigation time increased, because a part of the water leached the salts below the root zone. Salt accumulation increased with increase in clay content of the soil and salt content of the irrigation water. The expected sodium hazard of irrigation waters can be estimated by using the equation developed by Bower, Ogata and Tucker.--Copyright 1974, Biological Abstracts, Inc.
W76-09926

SALINITY TOLERANCE OF INLAND HALOPHYTIC VEGETATION OF NORTH AMERICA,
Caen Univ. (France). Laboratoire de Physiologie Vegetale.
I. A. Ungar.
Bull Soc Bot Fr. 120(5/6), p 217-222, 1973.

Descriptors: *Salt tolerance, Vegetation, Distribution, *Halophytes, *North America, Salinity, Soil moisture, Saline soils.

The distribution of inland halophytic species of North America is chiefly affected by 2 environmental factors, soil moisture and soil salinity which interact to determine the soil water potential. Seasonal changes in soil moisture and soil salinity have a marked effect on halophyte seedling establishment and this leads to a great decrease in the number of plants surviving to maturity on the salt pans. Zonation in these environments is controlled by plant species tolerance to salinity and their ability to compete with other species under more moderate conditions.--Copyright 1974, Biological Abstracts, Inc.
W76-09988

3D. Conservation In Domestic and Municipal Use

URBAN DRAINAGE STUDIES,
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 5B.
W76-09402

GIVE STORMWATER POLLUTANTS THE SPIN,
Municipal Environmental Research Lab., Edison, N.J. Storm and Combined Sewer Section.
For primary bibliographic entry see Field 5D.
W76-09461

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: BALTIMORE, MARYLAND, MUNICIPAL WATERSHEDS,
Northeastern Forest Experiment Station, Pennington, N.J.
For primary bibliographic entry see Field 4D.
W76-09464

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: NEWARK, NEW JERSEY, MUNICIPAL WATERSHEDS,
Northeastern Forest Experiment Station, Pennington, N.J.
For primary bibliographic entry see Field 4D.
W76-09465

SUMMARY OF MUNICIPAL WATERSHED MANAGEMENT SURVEYS IN EASTERN UNITED STATES,
Southeastern Area State and Private Forestry, Atlanta, Ga.
For primary bibliographic entry see Field 4D.
W76-09466

MUNICIPAL WATERSHED MANAGEMENT: WHAT ARE THE OPPORTUNITIES,
Northeastern Forest Experiment Station, Pennington, N.J.
For primary bibliographic entry see Field 4D.
W76-09472

MODERN TECHNIQUES OF WASTE DETECTION,
East Worcestershire Waterworks Co., Bromsgrove (England).
For primary bibliographic entry see Field 5F.
W76-09685

ILLUDAS - THE ILLINOIS URBAN DRAINAGE AREA SIMULATOR,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2E.
W76-09735

SECONDARY EFFECTS OF PUBLIC INVESTMENTS IN HIGHWAYS AND SEWERS.
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5G.
W76-09778

A LINEAR PROGRAMMING MODEL FOR USE IN GUIDING URBAN FLOODPLAIN MANAGEMENT,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6F.
W76-09849

3E. Conservation In Industry

POWER GENERATION IN ARIZONA AND ITS ENVIRONMENTAL IMPLICATIONS,
Arizona Univ., Tucson. College of Engineering, Engineering Experiment Station.
For primary bibliographic entry see Field 6D.
W76-09485

RADIATION FOR A CLEAN ENVIRONMENT.
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5D.
W76-09512

RADIATION RECYCLING PROCESS OF WASTE POLY(TETRAFLUORETHYLENE) SCRAP,
Kyoto Univ., (Japan). Faculty of Engineering.
For primary bibliographic entry see Field 5D.
W76-09556

ENERGY MODELING AND FORECASTING.
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 6A.
W76-09602

A PROBABILISTIC MODEL OF THE OIL AND GAS DISCOVERY PROCESS,
Alfred P. Sloan School of Management, Cambridge, Cambridge Mass.
For primary bibliographic entry see Field 6A.
W76-09604

COUPLED ENERGY SYSTEM-ECONOMIC MODELS,
Brookhaven National Lab., Upton, N.Y. Energy Systems Analysis Group.
For primary bibliographic entry see Field 6A.
W76-09605

METHDOLOGICAL ISSUES IN THE ECONOMETRIC ESTIMATION OF ENERGY DEMAND ELASTICITIES,
Wharton School of Finance and Commerce, Philadelphia, Pa. Dept. of Economics.
For primary bibliographic entry see Field 6A.
W76-09607

ENERGY SYSTEMS: MODELING AND POLICY PLANNING,
Massachusetts Inst. of Tech. Cambridge. Energy Lab.

For primary bibliographic entry see Field 6A.
W76-09608

ENERGY CONSUMPTION AND FUEL CHOICE BY RESIDENTIAL AND COMMERCIAL CONSUMERS IN THE UNITED STATES,
Massachusetts Inst. of Tech., Cambridge. Energy Lab.
For primary bibliographic entry see Field 6A.
W76-09609

ENERGY MODELS AND FORECASTS: A USER'S POINT OF VIEW,
Exxon Corp., New York. Corporate Planning Dept.
For primary bibliographic entry see Field 6A.
W76-09612

ENERGY MODELS AND FORECASTS: A USER'S POINT OF VIEW,
Pacific Gas and Electric Co., San Francisco, Calif.
For primary bibliographic entry see Field 6A.
W76-09613

MODERN TECHNIQUES OF WASTE DETECTION,
East Worcestershire Waterworks Co., Bromsgrove (England).
For primary bibliographic entry see Field 5F.
W76-09685

HYDROLOGY OF THE MADISON FORMATION AND ITS POTENTIAL USE FOR WATER SUPPLY FOR ENERGY DEVELOPMENT,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2F.
W76-09757

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: GRAIN PROCESSING SEGMENT OF THE GRAIN MILLS INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-09775

WATER USE POLICIES AND POWER PLANT ECONOMICS,
Houston Univ., Tex.
For primary bibliographic entry see Field 5G.
W76-09776

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: FERTILIZER INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-09777

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: APPLE, CITRUS AND POTATO PROCESSING SEGMENTS OF THE CANNED AND PRESERVED FRUITS AND VEGETABLE INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-09779

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: INSULATION FIBERGLASS INDUSTRY.
Environmental Protection Agency, Washington, D.C. Office of Planning and Evaluation.
For primary bibliographic entry see Field 5G.
W76-09780

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE MAJOR COAL AND OIL SHALE AREAS OF WYOMING, 1975-76,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4A.
W76-09833

OFFSHORE PETROLEUM AND NEW ENGLAND - A STUDY OF THE REGIONAL ECONOMIC CONSEQUENCES OF POTENTIAL OFFSHORE OIL AND GAS DEVELOPMENT,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
For primary bibliographic entry see Field 6B.
W76-09893

3F. Conservation In Agriculture

EFFECT OF DIFFERENT SPRING SOIL MOISTURE LEVELS ON MOISTURE STRESS,
National Weather Service, Cincinnati, Ohio. River Forecast Center.
D. Zanzalari, and R. H. Shaw.
Iowa State J Res. 49(1); p 23-38, 1974.

Descriptors: *Soil moisture, *Moisture tension, *Corn(Field), *Crop yield.

A program for predicting soil moisture and a stress index for corn was used to measure the effect of different levels of spring soil moisture on corn yields. A regression equation using the stress index was used to estimate corn yields. Three spring-moisture starting levels were used: 20%, 60% and 100% of field capacity. Actual weather data for each year for the 20-yr period, 1951-1970, were used to compute an estimated yield for each year for each starting level of spring moisture. When the 100% start was compared to the 20% start, the average yield reduction ranged from 3750 kg/ha in northwestern Iowa (USA) to near 1800 kg/ha in central and eastern Iowa. A greater reduction in yield occurred when the starting soil moisture dropped from 60-20% of field capacity, compared with a drop from 100-60%. The value of the field capacity also affected this difference, with higher capacity soils showing a greater decrease in yield than did lower capacity soils when starting soil moisture dropped from 60-20%.--Copyright 1975, Biological Abstracts, Inc.
W76-09412

COST OF PRODUCING CROPS IN THE IRRIGATED SOUTHWEST, PART II: NEW MEXICO,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
N. G. Wright, T. M. Stubblefield, G. O. Ott, W. D. Gorman, and R. R. Lansford.
Arizona Agricultural Experiment Station, Technical Bulletin 222. 1976. 30 p, 1 fig, 26 tab, 26 append.

Descriptors: *Cost analysis, Water resources development, *Crop production, *Planning, *Cultivated land, *Irrigated land, Economic feasibility, Cost comparison, Water utilization, Land development, Agriculture, Irrigation programs, *New Mexico, Marketing, *Budgeting.
Identifiers: Synthetic budgeting method.

This study is part of a project designed to supply information necessary to maximize the agricultural base in southwestern states and to aid realistic planning of profitable agri-businesses using irrigated land. Some southwestern lands are now under irrigated cultivation and use; additional acreage could be irrigated wherever such utilization would have economic advantages over alternative uses for the land and water. Water resources in eight New Mexico regions were assessed, crop marketing procedures described and production costs estimated for the major irrigated crops. Slightly more than 1 million acres were irrigated for crop production in 1970 and 1971. The only surplus of surface water is in San Juan County. Work is progressing on the Navajo Irrigation Project which aims to develop 110,000 acres of irrigated land using surface water from the San Juan River. Water will be available for the first 10,000 acre block of farm land in 1976. Costs were computed using a synthetic budgeting method and in such a manner as to be comparable with similar costs in other states. (See also W76-00383) (Jahns-Arizona)
W76-09475

REDOX POTENTIAL IN IRRIGATED DESERT SOILS AS AN INDICATOR OF AERATION STATUS,
Imperial Valley Conservation Research Center, Brawley, California.
For primary bibliographic entry see Field 2G.
W76-09488

A QUANTITATIVE ANALYSIS OF THE FACTORS AFFECTING PLANT NUTRIENT UPTAKE FROM SOME SOILS,
University of Oxford, Oxford, England, Soil Science Laboratory.
For primary bibliographic entry see Field 2G.
W76-09489

FIELD DRAINAGE WITH MANIFOLD WELL POINTS,
Agricultural Research Service, Weslaco, Tex.
For primary bibliographic entry see Field 5G.
W76-09586

HOWELL BUNGER VALVES AS IRRIGATION OUTLETS,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
M. C. Goel.
Indian Journal of Power and River Valley Development, Vol. XXV, No. 3, p 90-94, March 1975. 1 fig, 3 tab.

Descriptors: *Irrigation, *Rivers, *Projects, Behavior, Performance, Valves.
Identifiers: *Bunger valves, India(Ram Ganga Project).

While making choices for irrigation outlets for Ram Ganga Project, a multipurpose scheme seeking to provide irrigation, hydro-electric power, and flood benefits in Uttar Pradesh, extensive studies were made concerning behavior and performance of Howell bunger valves provided at other projects. Considered is the performance of these valves and the reasons for adopting them for Ram Ganga Project. From the study of causes of failures of various Howell bunger valves in the past, the design practice regarding the thickness of valve body and cylinderical cover, the thickness and number of radial vanes, and the diameter of central hub has been considerably improved. After incorporating these improvements for Ramganga, it is felt that the Howell bunger valves will work satisfactorily. (Bell-Cornell)
W76-09615

A COMBINED MODEL FOR OPERATING IRRIGATED AGRICULTURAL SYSTEMS UNDER UNCERTAINTIES,
Technion - Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.
I. Amir, Y. Friedman, S. Sharon, and A. Ben-David.
Transactions of the ASAE, Vol. 19, No. 2, p 299-304, Mar./Apr. 1976. 2 fig, 5 tab, 9 ref.

Descriptors: *Irrigation systems, Agriculture, *Planning, *Operations research, *Linear programming, *Simulation analysis, *Computer programs, Optimization, Decision making, Monitor-

ing, Cotton, Queueing theory, Hydraulics, Scheduling, Constraints, Equations, Systems analysis, Mathematical models, *Risks.

Irrigation is a well-defined sub-system in a comprehensive agricultural production system. Both of these systems are interrelated. An adaptable ad hoc linear model has been found to be suitable for planning and operating the entire system under uncertainties. This model is the framework of the irrigation sub-system. Unfortunately, many of the factors involved in irrigation create nonlinear functions and thus cannot be directly included in the linear model. This paper suggests using a linear model to (1) solve the overall system for optimality, (2) to check by a simulation technique whether the solution is feasible and meets the irrigation system set-up and requirements, and (3) to change, if necessary, one or both of the systems in order to achieve the best feasible comprehensive solution. The combined model has been carried out for 89 possible different cotton activities of 430 ha, reflecting various irrigation equipment and methods. The outcome provides a detailed irrigation timetable and a list of the required parameters (pressure heads and discharges) for controlling the hydraulic network as well as the optimal overall solution. (Bell-Cornell)
W76-09634

AQUEDUCT OPTIMIZATION WITH INTERMEDIATE STORAGE,
California Univ., Berkeley. Lawrence Berkeley Lab.; and California Energy and Environment Div.
For primary bibliographic entry see Field 4A.
W76-09636

SUBSTITUTE CHEMICAL PROGRAM - INITIAL SCIENTIFIC AND MINIECONOMIC REVIEW OF CAPTAN.
Midwest Research Inst. Kansas City, Mo.
For primary bibliographic entry see Field 5C.
W76-09651

UPWARD WATER MOVEMENT IN FIELD CORES,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
L. G. Wells, and R. W. Skaggs.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 2, p 275-283, March-April, 1976. 12 fig, 3 tab, 29 ref.

Descriptors: *Groundwater movement, *Subsurface irrigation, *Cores, *Model studies, Laboratory tests, Theoretical analysis, Hydraulic properties, Soil properties, Soil profiles, Soil water movement, Design, Water table, Equations, Irrigation, Pressure head, Moisture content, Boundaries(Surface), Tensiometers, Hydraulic gradient, Hysteresis.
Identifiers: *Upward water movement, *Richards equation, *Imbibition, Desorption.

Subirrigation experiments were conducted under various initial and boundary conditions using large, undisturbed cores from two field soils. The pressure head distribution and flow volume were measured continuously, and the desorption and imbibition character of the soil water were determined using pressure plates. The effect of air entrapment on water content was determined gravimetrically, while the hydraulic conductivity-pressure head relationship was determined for each soil from transient pressure head measurements during a drainage event. An approximate model was developed to describe vertical water movement during subirrigation. This model as well as the Richards equation were tested against experimental results from both soils. Substantial variability was evident in both measured soil properties and in water movement phenomena. The approximate subirrigation model provided acceptable agreement with the observations. Consideration of soil stratification generally improved model accuracy. For engineering design the added time and expense of sophisticated models are not justified in comparison to the approximate model. Determination of the total volume of stored water in a profile under specified boundary conditions is essential to predictions of water movement. (Visocky-ISWS)
W76-09726

THE LEACHING BEHAVIOR OF DIFFERENT NITROGEN SOURCES IN LYSIMETER EXPERIMENTS, (IN GERMAN),
Badische Anilin- und Soda-Fabrik A. G., Ludwigshafen am Rhein (West Germany). Landwirtschaftliche Versuchsstation.
For primary bibliographic entry see Field 2G.
W76-09793

THE WATER SUPPLY SYSTEM OF SOIL AND NITROGEN LOSS WITH RUNOFF WATERS IN NONCHERNOZEM AREAS, (IN RUSSIAN),
Moskovskaya Selskokhozyaistvennaya Akademiya (USSR).
For primary bibliographic entry see Field 2G.
W76-09794

THE EFFECT OF SILICON OILS ON THE WATER LOSS OF HORDEUM VULGARE L, (IN GERMAN),
Leipzig Univ. (East Germany). Bereich Pflanzenphysiologische Mikrobiologie.
For primary bibliographic entry see Field 3B.
W76-09806

EFFECTIVENESS OF WATER UTILIZATION BY PLANTS, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Institut Fiziologii Rastenii and Agrokhimii.
For primary bibliographic entry see Field 2D.
W76-09809

SUGAR BEET PHOTOSYNTHESIS AND PRODUCTIVITY CULTIVATED BY IRRIGATED FARMING IN THE KIRGIZ SSR, (IN RUSSIAN),
Kirghiz State Univ., Frunze (USSR).
V. A. Pechenov, and A. S. Okanenko.
Fiziol Biokhim Kul't Rast. 6(3), p 227-231, 1974.

Descriptors: *Photosynthesis, *Sugar beets, *Productivity, Irrigation, Seasonal, Farm management, Crop production.
Identifiers: USSR(Kirgiz-SSR), Mineral nutrition(Plants).

The data are presented on intensity of sugar beet photosynthesis and productivity under irrigation. Regularities in daily and seasonal dynamics of the photosynthesis intensity were established as dependent on meteorological factors and on the level of mineral nutrition and water supply of plants.--Copyright 1975, Biological Abstracts, Inc.
W76-09810

A WATER-LAND USE MANAGEMENT MODEL FOR THE SEVIER RIVER BASIN PHASES I AND II,
Utah State Univ., Logan.
For primary bibliographic entry see Field 4A.
W76-09844

IRRIGATION SYSTEMS IN TAIWAN: MANAGEMENT OF A DECENTRALIZED PUBLIC ENTERPRISE,
Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
M. E. Abel.
Water Resources Research, Vol. 12, No. 3, p 341-348, June 1976. 1 fig, 1 tab, 22 ref.

Descriptors: *Irrigation systems, *Canals, *Management, *Irrigation efficiency, Water resources, Planning, Operations, Agriculture, Water policy, Engineering, Agronomy, Legal aspects, Administration, Rice, Water utilization.
Identifiers: *Taiwan.

The efficiency of the management of irrigation systems in Taiwan, viewed as decentralized public enterprises, depends on four interrelated factors: (1) the recognition that water is a scarce factor in agricultural production; (2) the legal administrative basis for centralized planning of irrigation investments but decentralized management of irrigation systems; (3) the information systems which permit the exchange of agronomic and engineering information between the users of water and the managers of irrigation systems; and (4) the use of incentive structures for both the managers of irrigation systems and the users of water that appear to be compatible with the efficient use of water within the irrigation system. Discussed also is the true complexity of irrigation systems and irrigated crop production found in Taiwan today with which the management of these systems must contend. (Bell-Cornell)
W76-09848

IRRIGATION SYSTEM PIVOT SWIVEL,
G. V. Seger, and W. E. Fluhr.
U.S. Patent No. 3,951,165, 3 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1142, April 20, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Distribution systems, *Irrigation efficiency, Water distribution(Applied), Water delivery, Irrigation practices.

The invention relates to center pivot irrigation systems of the type where a long water distribution pipe is supported by a number of wheeled towers for rotation over the ground and around a central pivot point to which the main distribution pipe is attached and from which the irrigation water is supplied. A free standing swivel pipe connector for a center pivot irrigation system has a vertical water carrying conduit with pipe elbows attached to the upper and lower ends. The upper portion of the pipe, including the upper elbow is rotatable around the longitudinal axis of the vertically standing conduit while the lower portion of the vertical pipe and lower elbow are fixed. The swivel joint between the fixed and rotatable pipe portions acts with an associated brace member which interconnects the two portions of the pipe to provide an articulating joint permitting it a single degree of freedom in a plane coincident with the main distribution pipe to which the upper elbow is attached. The articulating brace member placed bilaterally of the vertical pipe, is connected to the lower chord of the pipe truss in the irrigation system to reduce bending moments in the vertical swivel pipe. (Sinha - OEIS)
W76-09866

LIQUID DISTRIBUTION SYSTEM FOR IRRIGATION AND THE LIKE,
A. F. DuFresne.
U.S. Patent No. 3,951,339, 5 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1202, April 20, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation practices, *Irrigation efficiency, *Remote control, Automatic control, Control systems, Electronic equipment.

An electrically controlled liquid distribution system for irrigation and the like comprises a central sequencing control station for controlling a remote valve station. The valve station provides local fault-sensing feedback control over actuation current supplied to a remote control valve. Conductor means, preferably comprising a single pair of conductors, connect the central station to the

remote valve station. In one embodiment, the feedback control results in a change in current level flowing in the conductors after the remote control valve opens, and circuitry in the central station detects this change in current level to control an indicator. (Sinha - OEIS)
W76-09868

IRRIGATION VEHICLE,
E. E. Jenkins.
U.S. Patent No. 3,951,341, 4 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1202, April 20, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Conveyance structures, *Sprinkler irrigation, *Irrigation efficiency, Irrigation practices, Water distribution(Applied), Pipes.
Identifiers: Irrigation pipes.

A motorized tubular frame four-wheeled irrigation vehicle is adapted to straddle a row of crops without damage to the row. The vehicle has swivel wheels at the back end and carries a horizontal bar across the front end. The carrying bar is mounted so that it can swivel and is adapted to carry a length of irrigation piping in a horizontal position. The piping has a row of longitudinaly aligned and spaced apart sprinkling openings positioned so as to only sprinkle towards the rear of the vehicle to avoid forming mud in front of the vehicle's wheels. The vehicle can be used either individually or in combination with other identical vehicles placed side-by side. (Sinha - OEIS)
W76-09869

DRIP LEVEL IRRIGATION,
R. Mehoudar.
U.S. Patent No. 3,951,345, 5 p, 14 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1204, April 20, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation systems, *Irrigation efficiency, Distribution systems, Water distribution(Applied), Water pressure.
Identifiers: *Drip level irrigation.

An elongated dripper unit is comprised of an enclosure sealed at either end and formed with a liquid inlet and outlet, at least one longitudinal partition formed in the enclosure so as to divide the enclosure into at least two sub-enclosures, and a plurality of lateral partitions each of which extends laterally across the other enclosure from the enclosure wall to an inner longitudinal partition so as to subdivide each sub-enclosure into a number of cells which connect with each other through reduced-diameter apertures formed in the longitudinal partitions. The cells include an input cell connected with the inlet, an output cell connected with the outlet and a number of intermediate cells. The flow path extends from the input cell to the output cell via the intermediate cells. The pressure of the water is progressively reduced as a result of passage through connecting apertures and as a result of repeated abrupt directional changes. (Sinha - OEIS)
W76-09870

EFFICIENCY OF IRRIGATION METHODS FOR STRAWBERRIES,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
J. M. Myers, and S. J. Locascio.
Proc Fla State Hortic Soc. 85, p 114-117, 1972.

Descriptors: *Irrigation efficiency, *Sprinkler irrigation, *Furrow irrigation, Irrigation practices, Salinity, Soils, Strawberries.
Identifiers: *Trickle irrigation.

Trickle, overhead sprinkler and furrow irrigation methods were compared in a strawberry production experiment. Rainfall during the season was above normal. Yield and size of fruit were not affected by irrigation method. Irrigation method was a significant factor with regards to movement of soluble salts in the bed. Movement of salts was towards the upper center part of the bed for the sprinkler and furrow methods, while significant movement was not detected for the trickle method. Soil moisture content in the rooting zone was maintained near field capacity on a continous basis by the trickle method, while the sprinkler and furrow methods were effective in returning the soil moisture content to field capacity when applications were made; but this was followed by a gradual depletion to almost the soil moisture level of the unirrigated treatment before the next application. Approximately 1/2 the quantity of water was used for the trickle method as compared to the sprinkler and furrow methods.--Copyright 1974, Biological Abstracts, Inc.
W76-09897

EFFECT OF EXCESS SOIL MOISTURE ON THE CONTENT OF PHOSPHORUS COMPOUNDS IN BARLEY, (IN RUSSIAN),
Leningrad State Pedagogical Inst. (USSR). Dept. of Botany.
V. V. Anikiev, and N. M. Gorbushina.
Biol Nauki. 17(2), p 88-91, 1974.

Descriptors: *Soil moisture, *Barley, *Phosphorus, Metabolism, Soils, Crop production.
Identifiers: ADP, ATP, Organogenesis.

The nucleic acid and lipid P in barley was studied under optimal and excess soil moisture conditions. Excess soil moisture had an adverse effect on P metabolism. The content of all P fractions decreased with excess soil moisture. The change in the quantity of the acid-soluble fraction of P, which includes substances playing a leading role in energy metabolism (ATP, ADP, adenylic acid, etc.) was noted. Under optimal soil moisture conditions the accumulation of organic forms of P was observed before crucial stages of organogenesis and their breakdown during the formation of generative organs. Excess soil moisture disrupted normal development, which adversely affected general metabolism and yield.--Copyright 1975, Biological Abstracts, Inc.
W76-09913

METEOROLOGICAL FACTORS AND DISEASE EXPRESSIONS IN JUTE,
Jute Agricultural Research Inst., Barrackpore (India). Mycology and Plant Pathology Div.
N. Mukerjee.
Proc Indian Natl Sci Acad Part B Biol Sci. 37(6), p 384-393, 1971(1973).

Descriptors: Meteorology, Rainfall, Asia, *Plant diseases.
Identifiers: Corchorus-capsularis, Corchorus-olitorius, *Jute, India.

In a bid to forecast diseases of jute, microclimatic and meterological factors were assessed under identical cultural conditions for 3 yr on 6 varieties of jute belonging to Corchorus capsularis and C. olitorius at Nilganj, Barrackpore, West Bengal (India). Irrespective of species, diseases in general were more in 1st date of sowing (22nd March), lesser in 2nd (10th April) and the least in 3rd date (1st May). The disease expressions were ascribed to rainfall after 10-11 wk crop-growth in 1st date, 9 wk in 2nd date and 5-6 wk in the 3rd date of sowing in a yr. The pattern of rainfall, though remained same in the 3 dates of sowing in a year, differed from year to year accounting yearly variations of diseases in the varieties. The total rainfall in 3 dates of sowing separately was almost same in a year. The percentage of total crop-period receiving rainfall, in different dates of sowing, differed. This was minimum in 1st date (43%) more in 2nd (48%) and maximum in the 3rd date (54%). The soil and air temperature and humidity inside the crop in any date of sowing in a year differed negligibly after the crop attained a height of 2 ft to influence the disease percentage reasonably. C. olitorius was affected more than C. capsularis, in general, in 2 yr.--Copyright 1974, Biological Abstracts, Inc.
W76-09931

CROP RESPONSE TO CHISELING AND IRRIGATION IN SOILS WITH A COMPACT A2 HORIZON,
Agricultural Research Service, Florence, S. C. Coastal Plains Soil and Water Conservation Research Center.
C. W. Doty, R. B. Campbell, and D. C. Reicosky.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 4, p 668-672, July-August 1975, 7 fig, 4 tab, 14 ref.

Descriptors: *Crop response, *Chiseling, *Irrigation, *Irrigation effects, *Crop production, *Corn(Field), Furrow irrigation, Soil compaction, Soil profiles.
Identifiers: Millet, Sweet corn.

The objective was to determine the yield of millet and sweet corn under four soil-water management regimes and to evaluate yield differences in terms of oxygen stress, depth of rooting, and soil water status in a coarse-textured soil with a compact A2 Horizon. The experiment was conducted on a Varina sandy loam soil with a slope of less than 1 percent. Millet was grown as a test crop in 1969 and 1970 and sweet corn was grown in 1972 and 1973. The split-plot experiment consisted of two primary tillage treatments as main plots, with and without furrow irrigation. Irrigation increased yields during drought periods, but yields were less on irrigated than on nonirrigated plots during periods when the rainfall exceeded pan evaporation. The irrigated plants showed greater oxygen stress when heavy rains followed an irrigation, than those on nonirrigated plots. The probability of receiving enough rainfall to saturate the top 30 cm of soil several times during the growing season is high, and this excess soil-water causes poor root aeration, and plant growth may decrease significantly from the resulting low soil aeration. Chiseling the compact A2 Horizon increased the rooting depth and plant water availability in the soil profile. During dry periods chiseling provided a soil environment in which roots proliferated to a greater depth and extracted enough water to eliminate or minimize water stress. During wet periods, the chiseled soil permitted water to infiltrate and percolate to greater depths, thus avoiding saturated conditions in the root zone. Chiseling the soil to a 38-cm depth provided a rooting environment which produced significantly more dry matter and larger net crop values. (Skogerboe-Colorado State)
W76-09985

PLANTING PATTERN, PLANT POPULATION, IRRIGATION, AND INSECT INTERACTIONS IN COTTON.
California Univ., Riverside. Dept. of Entomology.
T. F. Leigh, D. W. Grimes, W. L. Dickens, and C. E. Jackson.
Environ Entomol. 3(3), p 492-496, 1974.

Descriptors: *Cotton, Farm management, *Irrigation, *Insects, *Plant populations, *Planting management.
Identifiers: Empoasca-Sp, Geocoris-Pallens, Lygus-Hesperus, Orius-Tristicolor.

Cotton was planted in a factorial combination of 3 irrigation schedules and 4 plant populations in a randomized complete block design. Each treatment combination was sampled on 3 dates with a vacuum insect sampler. Lygus hesperus Knight, a complex of leafhoppers (Empoasca), Geocoris pallens Stal, and Orius tristicolor White were present in large numbers. Significant differences in insect numbers between plant populations and/or between irrigation regimens were deter-

mined for each species or species group on 1 or more of the 3 sampling dates. Generally, insect populations were greatest at higher plant densities and with more frequent irrigation, factors which increased the density of plant canopies.--Copyright 1974, Biological Abstracts, Inc.
W76-09998

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

EFFECTS OF STORM DISCHARGES ON RIVER WATER QUALITY,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5B.
W76-09401

URBAN DRAINAGE STUDIES,
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 5B.
W76-09402

EFFECT OF THINNING ON THE FOLIAGE AND FOREST FLOOR PROPERTIES OF PONDEROSA PINE STANDS,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
A. G. Wollum, and G. H. Schubert.
Soil Science Society of America Proceedings, Vol. 39, No. p 968-972 , Sept.-Oct., 1975. 6 fig, 2 tab, 18 ref.

Descriptors: *Ponderosa pine trees, *Forest management, *Forest soils, *Soil moisture, *Nutrient, *Soil-water-plant relationship, Plant growth, Water requirements, Soil temperature, Soil horizons, Coniferous forests, Foliar, *Arizona.
Identifiers: *Growing stock level(GSL), *Thinning, Taylor Woods(Ariz).

A study at the Taylor Woods site near Flagstaff, Arizona documents nutrient levels in the foliage for ponderosa pine (Pinus ponderosa Laws.) stands of different densities and the effect of stand density on growth. The longest and heaviest needle fascicles were associated with greater pine stand thinning intensities 8 year after treatment. Foliar nutrient concentrations did not change significantly with different thinning regimes; total nutrients in the forest floor were inversely proportional to the degree of thinning. Since there were no statistical differences in needle length or weight at the four heaviest thinning levels, it was concluded that foliage development is not markedly affected by growing stock levels (GSL) from 6.9 to 23 m2/ha. Thinning results in improved soil water and nutrient supplies and increased soil temperatures. Moisture use is even less after removal of understory vegetation. At this site trees are growing faster at lower GSL, and the limited moisture is shared by fewer trees. The increased soil temperature aids nutrient mineralization. (Jahns-Arizona)
W76-09474

DROUGHT ADAPTATIONS IN TWO CALIFORNIAN EVERGREEN SCLEROPHYLLS,
Australian National Univ., Canberra. Dept. of Environmental Biology; and Australian National Univ., Canberra. Research School of Biological Sciences.
For primary bibliographic entry see Field 2I.
W76-09476

DISTRIBUTION OF PONDEROSA PINE FOREST DENSITIES ON THE SALT-VERDE RIVER BASIN,
Arizona Univ., Tucson. School of Renewable Natural Resources.
P. F. Ffolliott, and M. S. Rhey.
Agricultural Experiment Station Technical Bulletin 227, 1976. 10 p, 1 fig, 37 tab, 4 ref.

Descriptors: *Forest management, *Ponderosa pine trees, *Natural resources, *Spatial distribution, *Forests, Planning, Surveys, Canopy, Land management, *Arizona.
Identifiers: *Salt-Verde River Basin(Ariz).

Information is provided for land management planning on the proportions of the Salt-Verde River Basin of north-central Arizona that support given minimum densities of ponderosa pine. The information will supplement previous descriptions of the Basin's ponderosa pine forests. Survey data are presented in 37 tables on the proportions of national forest and Indian tribal lands within the basin that support minimum timber basal area levels. Basal area is defined as the total cross-sectional area in square feet of all tree boles measured 4 1/2 feet above ground, expressed on a per unit-area basis. This measurement was selected as the expression of timber overstory density because it is readily determined in the field, easily converted to other expressions of forest density, and has already been used as an independent variable to develop many multiple use relationships. The basic information presented can be used in the assessment of potential productivities and natural resources utilization. (Jahns-Arizona)
W76-09477

WATER SYSTEM BEHAVIOR: DETERMINANTS IN AN ARID REGION,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
M. G. Wolman.
In: Symposium on Arid Zone Development: Potentialities and Problems, October 23-25, 1975, Boston. 20 p, 3 tab, 33 ref.

Descriptors: *Arid lands, *River basin development, *River systems, *Ephemeral streams, *Water utilization, Discharge(Water), Sedimentation, Surface runoff, Irrigation effects, Humid areas, Saline water, Watershed management, Crop production, River basins, River flow, Drainage systems.

Some characteristics of arid or semi-arid rivers in arid regions and the resultant forms of water-utilization are described, comparing these with perennial rivers which flow through arid regions. There is a direct relationship between the river system in a humid region and the drainage area as a whole. In contrast, the river system in many arid regions responds to drainage basin inputs but is ephemeral and lacks continuity in space and time. A continuous river system within an arid region owes its origin and much of its behavior to sources outside the region. Land and water use in the closed or arid system may have different consequences than those in the humid system. The most likely measures of efficiency in such a system are those related to relative inputs and outputs of water and energy to produce food. Common patterns of land and water management are discussed, along with questions of agriculture and other productivity. Evapotranspiration, runoff, stream flow, sedimentation and salinity changes with irrigation relating to such river systems are also discussed. (Jahns-Arizona)
W76-09483

HYDROLOGIC SYSTEMS ANALYSIS MODEL FOR GENERATING RUNOFF TIME SERIES (HIDROLOGIAI) RENDSZERVIZSGALATI MODELL VIZHOZAMIDOSER ELOALLITASARA (II. RESZ),
BME Institute for Water Resources and Hydraulics, Budapest (Hungary).
For primary bibliographic entry see Field 2A.
W76-09557

RESEARCH AND INVESTIGATION OF GEOLOGY, MINERAL, AND WATER RESOURCES OF MARYLAND.
Geological Survey, Baltimore. Maryland
Available from the National Technical Information Service, Springfield, VA 22161, as N75 26458, $5.50 in paper copy, $2.25 in microfiche. Final Report, Maryland Geological Survey, September 1974. 90 p, 22 ref. Weaver, K. N., principal investigator. NASA NAS5-21848.

Descriptors: *Remote sensing, *Geologic formations, *Beaches, *Chesapeake Bay, *Maryland, Geology, Rocks, Coasts, Bays, Geomorphology, Vegetation, Sediments, Marshes, Ice, Satellites(Artificial), Aircraft, Photography, *Mapping.
Identifiers: *ERTS.

For Western Maryland Piedmont, the major application of ERTS-1 imagery is detection of regional structural features such as fold culminations and lineaments. These structural features are important from the aspect of mineralization and mineral resources. Generalized mapping and detection of coastal geomorphic forms has been successfully applied to the Chesapeake Bay region. Through the primary use of MSS band 7 and MSS color composite, beach distribution maps for Chesapeake Bay and linear ridge distribution maps for the tidal salt marshes for the Lower Eastern Shore have been produced. Attempts to map nearshore bedforms proved unsuccessful from ERTS-1 imagery due to the small-scaled nature of the bedforms and interference of scan lines and nearshore turbidity. Small-scaled sand waves along the Atlantic Ocean coastline were mapped primarily by low-level aircraft support. Some observations were made on suspended sediment pattern but because of lack of technical experience, facilities and adequate ground truth, these observations need further investigation for any conclusive interpretation. Six papers are included in this report. Conclusions, recommendations, and references for all papers are grouped at the end of the report. (See W76-09571) (Sims - ISWS)
W76-09565

DIFFERENTIATION OF SERPENTINITIC FROM NON-SERPENTINITIC ULTRAMAFIC ROCKS IN ERTS-1 MSS IMAGERY,
Geological Survey, Baltimore, Maryland.
W. P. Crowley.
In: Research and Investigation of Geology, Mineral and Water Resources of Maryland. Final Report, Maryland Geological Survey, Johns Hopkins University, Baltimore, p 1-1 to 1-5, September 1974. 1 fig. NASA NAS5-21848.

Descriptors: *Remote sensing, *Rocks, *Maryland, Satellites(Artificial), *Land use, *Vegetation, Forests, Trees, Agriculture, Geology.
Identifiers: *ERTS, Serpentinitic rocks, Non-serpentinitic rocks.

Recent field work in Baltimore County revealed that the signature returns of serpentinitic and non-serpentinitic rocks correlates with the vegetation cover and land-use pattern. Non-serpentinitic supports a vigorous hardwood flora and some farming practices with a red signature return whereas serpentinitic rocks have stands of Virginia Pine and greenbriar with little land-use development. In Maryland Piedmont, bedrock lithology and structure are enhanced only to the extent that land-use is geologically dictated. (See also W76-09565) (Sims - ISWS)
W76-09566

OBSERVATION OF LINEAR FEATURES IN THE MARYLAND PIEDMONT AS SHOWN ON

ERTS-1 MSS IMAGERY AND AIRCRAFT SUPPORT PHOTOGRAPHY,
Geological Survey, Baltimore, Maryland.
J. Edwards, Jr.
In: Research and Investigation of Geology, Mineral and Water Resources of Maryland. Final Report, Maryland Geological Survey, Johns Hopkins University, Baltimore, p 2-1 to 2-3, September 1974.

Descriptors: *Remote sensing, *Geologic formations, *Maryland, Satellites(Artificial), Photography, Aircraft, Surveys, Geological surveys, Rocks, Geology, *Aerial photography.
Identifiers: *ERTS, Linear features.

Two prominent sets of linear features were detected on ERTS-1 imagery. One set was comprised of two belts trending N45 deg E and are composed of Sam's Creek Metabasalt (western belt) and quartzose facies of the Wissahickon Schist (eastern belt). The second set of linear features was detected between the western and eastern belts of the first set and trend N 20 deg E. These subtle features, such as lineaments, may be of significance in the interpretation of the regional geology and also may have practical importance in environmental geology, such as indicating zones of high groundwater yields, mineralization, or shattered and deeply weathered bedrocks. (See also W76-09565) (Sims - ISWS)
W76-09567

ACCURACY OF RESERVOIR INFLOW FORECASTS BASED ON RADAR RAINFALL MEASUREMENTS,
Karlsruhe Univ. (West Germany). Institut fuer Wasserbau III.
For primary bibliographic entry see Field 2B.
W76-09574

IDENTIFICATION OF LINEAR SYSTEMS RESPONSE BY PARAMETRIC PROGRAMING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2E.
W76-09575

CONCEPTUAL HYDROLOGICAL MODEL FOR AN AVERAGED-SIZED CATCHMENT AREA, I. CONCEPTS AND RELATIONSHIPS,
Institut Royal Meteorologique de Belgique, Brussels. Hydrology Section.
For primary bibliographic entry see Field 2A.
W76-09579

CONCEPTUAL HYDROLOGICAL MODEL FOR AN AVERAGE-SIZED CATCHMENT AREA, II. ESTIMATE OF PARAMETERS, VALIDITY OF MODEL, APPLICATION,
Institut Royal Meteorologique de Belgique (Brussels). Hydrology Section.
For primary bibliographic entry see Field 2A.
W76-09580

FIELD DRAINAGE WITH MANIFOLD WELL POINTS,
Agricultural Research Service, Weslaco, Tex.
For primary bibliographic entry see Field 5G.
W76-09586

THE COST ASSIGNMENT OF THE COOPERATIVE WATER RESOURCE DEVELOPMENT: A GAME THEORETICAL APPROACH,
Tokyo Inst. of Tech. (Japan).
For primary bibliographic entry see Field 6A.
W76-09619

DESIGN OF WATER RESOURCES PROJECT WITH INADEQUATE DATA IN INDIA - GENERAL AND PARTICULAR CASE STUDIES,
International Hydrological Decade, New Delhi (India). Indian National Committee.
S. Banerji, and V. B. Lal.
In: Design of Water Resources Projects with Inadequate Data. Proceedings of the Madrid Symposium, June 1973, Vol. 2; Unesco - WMO - IAHS, Unesco - OMM - Aish, 1974, p 323-334. 1 tab, 8 ref, append.

Descriptors: *Water resources, *Projects, *Design, *Rainfall-runoff relationships, *Hydrology, Reservoirs, Monsoons, Flood frequency, Meteorology, Hydrographs, Dams, Estimating, Equations, International Hydrological Decade.
Identifiers: *Inadequate data, *India.

India has rich experience in successful construction of water resources projects with inadequate data. While rainfall data of considerable length are available in or around the catchment, runoff observations are usually available for 10 years or less. Commonly, some gauge site some distance away from the dam site may be available. Data on soil moisture, infiltration, and evapotranspiration are almost non-existent. This paper, based on a study of several important reports relating to many projects situated in different climatological, topographical and geological regimes, describes the practices followed in: (1) transferring rainfall data from a hydrologically similar region to the reservoir catchment by short term correlation; (2) establishing correspondence between rainfall and runoff by applying a regional empirical formula, or by first deriving a regression equation for rainfall vs. runoff for the small period for which simultaneous records of both parameters are available and then applying it to longer rainfall records for getting the discharge series; and (3) transferring gauge discharge relationship of a distant site to the dam site to work out time distribution of inflows, and the peak flow. For the later, a method evolved for estimating maximum flood in the Narmada and Mahanadi rivers, principally based on assessing the contribution due to different zones of catchment each extending to one day's flow time, has been described for the benefit of monsoon regions. (Bell-Cornell)
W76-09621

DATA REQUIREMENTS FOR THE OPTIMIZATION OF RESERVOIR DESIGN AND OPERATING RULE DETERMINATION,
Geological Survey, Washington, D. C.
I. C. James, II.
In: Design of Water Resources Projects with Inadequate Data, Vol. 2, Proceedings of the Madrid Symposium, June 1973; Unesco - WMO - IAHS, Unesco - OMM - AISH, 1974, p 335-347. 2 fig, 1 tab, 16 ref.

Descriptors: *Multipurpose reservoirs, *Design, *Reservoir operation, *Optimization, *Projects, Irrigation, Reservoir storage, Reservoir releases, Economic efficiency, Data collection, Streamflow, Benefits, Decision making, Size, Gaging stations, Systems analysis, Estimating, *Reservoir design.
Identifiers: *Operating rules, *Data requirements.

Approaches to the design of multipurpose reservoirs have usually assumed a given set of operating rules. Conversely, studies of operating rules have often taken reservoir size as fixed. In only the former case have estimates of the optimal data requirements been made. This paper gives the estimates of and compares the optimal length of data sequences for reservoir design where operating rules are fixed, for operating rule determination where reservoir design is fixed, and for the combined determination of operating rules and reservoir size for a multipurpose reservoir where the benefit is a piecewise-linear function of storage and release. A strategy is developed for the data collection and project deferment. The shape of the benefits foregone versus time function is such that project deferment is usually optimal only where very short hydrologic records exist, and the effect of an uncertain project inception date is to increase the optimal-length of the data sequence. (Bell-Cornell)
W76-09622

IMPROVED TECHNIQUES FOR WATER RESOURCE SYSTEMS DESIGN,
Water Resources Board, Reading (England).
J. R. Sexton, and D. G. Jamieson.
In: Design of Water Resources Projects with Inadequate Data, Vol. 2, Proceedings of the Madrid Symposium, June 1973; Unesco - WMO - IAHS, Unesco - OMM - AISH, 1974, p 383-399. 7 fig, 1 tab, 3 ref.

Descriptors: *Water resources, *Design, *Reliability, *Simulation analysis, Hydrology, Frequency, Failures, Reservoirs, Pumped storage, Evaluation, Planning, Projects, Systems analysis, Mathematical models.
Identifiers: *Inadequate data, Flow data, Record length.

Flow data inadequacy can take different forms. One extreme is the complete lack of any information, but the more usual case is insufficient length of record since very long sequences of flow data are required to evaluate the yield and reliability of water resource systems with confidence. Using traditional concepts of failure and reliability, all water resource systems are being designed on inadequate data with only the degree of inadequacy varying between schemes. The use of simulation as a design technique has necessitated a more rigorous definition of reliability which accepts the lack of data yet maintains a means of comparing the reliability of different schemes both in terms of frequency and magnitude of failure. A new definition of reservoir reliability has been used for the hydrological design of the Wash Estuary Storage, a proposed series of pumped-storage reservoirs in south-east England. (Bell-Cornell)
W76-09624

MAXIMUM INFORMATION OBTAINABLE FROM INADEQUATE DESIGN DATA: FROM MULTIVARIATE TO BAYESIAN METHODS,
Arizona Univ., Tucson. Dept. of Management.
J. Weber, C. C. Kisiel, and L. Duckstein.
In: Design of Water Resources Projects with Inadequate Data, Vol. 2, Proceedings of the Madrid Symposium, June 1973; Unesco - WMO - IAHS, Unesco - OMM - AISH, 1974, p 401-417. 1 tab, 42 ref.

Descriptors: *Water resources development, *Design data, *Hydrologic aspects, Forecasting, Projects, Economics, Decision making, Mathematical models, Systems analysis.
Identifiers: *Inadequate data, *Bayesian decision analysis, Multivariate analysis, Uncertainty, Economic losses.

An overview is given of some theoretical and empirical issues involved in designing water resource projects in the face of inadequate data. The primary focus is on multivariate analysis of samples whose properties are not consistent with the assumptions of the analysis. The multivariate models discussed include multiple linear regression, discriminant functions, canonical correlation, principal components, and factor and cluster analysis. Each of these models is discussed in terms of its assumptions, data requirements and applications in hydrologic research. The Bayesian approach to parameter estimation and decision making is introduced for the purpose of considering both the uncertainty due to inadequate data and economic losses. It is concluded that, in contrast to the current tactic of using multivariate models without considering the assumptions involved, the use of Bayesian decision analysis, while not the final

answer, may be a viable alternative for anticipating poor design. It offers flexibility in incorporating prior (subjective) knowledge about probability distributions on design parameters and it encourages the design engineer to invoke his general ideas of loss functions associated with inaccurate estimation in many specific design problems. (Bell-Cornell)
W76-09625

THE COST-EFFECTIVENESS OF WATER RESOURCES SYSTEMS CONSIDERING INADEQUATE HYDROLOGICAL DATA,
Technion - Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 6A.
W76-09626

OPTIMAL OPERATION OF THE PUMPING STATIONS IN THE KINNERETH-ESHKOL SECTION OF THE NATIONAL WATER CARRIER,
Mekoroth Water Co. Ltd., (Israel). Research and Desalting Div.; and Technion - Israel Inst. of Tech., Haifa.
E. Damelin, and U. Shamir.
Journal of Hydrology (Amsterdam), Vol. 28, No. 2/4, p 271-288, February, 1976. 9 fig, 2 tab.

Descriptors: *Pumping plants, *Operations, *Simulation analysis, Hydraulics, Pumps, Reservoirs, Mathematical models, Flow, Optimal development plans, Decision making, Computer programs, Constraints, Economics, Hydraulics, Equations, Waves(Water), Economics, Hydraulic machinery.
Identifiers: Israel.

Water is pumped from the Kinnereth through the Eshed-Kinrot penstock into the Jordan Canal by means of three pumps arranged in series in the Eshed-Kinrot pumping station. The water is pumped out of Zalmon Reservoir by means of three vertical pumps operated by synchronous motors. Certain hydralic limitations on the activation of pumps are applied when the elevations in the canals reach specified values. This paper considers Eshkol reservoir as the terminus of the system being examined. Objectives are to: devise a logical model for simulating system operation and an economic model which considers operating costs; determine the best operating regime for both normal and exceptional conditions; and generate a large number of solutions for any conditions that may arise in future. Described is the hydraulic simulator which faithfully represents the behavior of the total system. Empirical concepts--lag, distortion, and dispersion--are discussed, as well as the effectiveness of policies. (Bell-Cornell)
W76-09629

EVALUATION OF FLOOD CONTROL UNDER CHANGING CONDITIONS,
Tokyo Univ. (Japan). Dept. of Civil Engineering.
Y. Takahasi.
Journal of Hydrology (Amsterdam), Vol. 28, No. 2/4, p 265-270, Feb. 1976.

Descriptors: *Flood control, *Evaluation, Effects, Rivers, Multiple-purpose reservoirs, Human population, River basin development, Flood protection, Projects, Peak discharge, Historic floods.
Identifiers: *River Tone(Japan).

In order to make a profound evaluation of the effectiveness of flood control works, many factors relating to the human society must be considered. The effects upon river regimes and the effectiveness on flood damage reduction by the flood control works since the beginning of the 20th century are discussed, taking the River Tone as an example. Early flood control works of the Tone River were mainly river channel improvement, levees, flood detention yards, cutoff channels, and floodways to the sea. Basic flood control policy was to let waters flow into the inside of the longitudinal continuous levees system and let them dash into the sea as quickly as possible. Current flood control works employ multiple purpose reservoirs together with conventional techniques, such as channel regulation and flood-ways. The evaluation of flood control projects should consider the passage of time in relation to human activities. The expression of magnitude of floods in terms of return periods has limited significance. Also, it is difficult to evaluate the net effect of flood control measures, because they are often executed for other purposes as well. Finally, the influence of flood control works on the regional environment and development should be considered in the evaluation of the flood control project. (Bell-Cornell)
W76-09630

INVESTIGATIONS INTO THE YIELD OF AN EXISTING SURFACE RESERVOIR AND AQUIFER SYSTEM,
Lancashire River Authority (England).
For primary bibliographic entry see Field 3B.
W76-09631

A PROCEDURE FOR ESTIMATING OFF-SITE SEDIMENT DAMAGE COSTS AND AN EMPIRICAL TEST,
Illinois State Water Survey, Urbana.
M. T. Lee, and K. L. Guntermann.
Water Resources Bulletin, Vol. 12, No. 3, p 561-575, June 1976. 5 fig, 3 tab, 22 ref.

Descriptors: *Agricultural watersheds, *Damages, *Costs, *Estimating, *Erosion, *Reservoirs, Methodology, Equations, Recreation, Benefits, Flood damage, Drainage, Storage, *Illinois, *Sediments.
Identifiers: Damage function.

Research was conducted to develop a methodology for estimating agricultural off-site sediment damage costs and an empirical estimate of such damages for a watershed is included. The economics of off-site sediment damage costs are discussed as a theoretical basis for the procedures developed. A detailed methodology is described for estimating five different types of off-site sediment damages commonly associated with rural watersheds. The methodology is then applied to a central Illinois watershed and estimates of individual types of damage are made. The estimates are combined into an off-site sediment damage function for the watershed, and the usefulness of the damage function for analyzing off-site sediment damages and achieving a reduction in those costs is discussed. (Bell-Cornell)
W76-09632

AQUEDUCT OPTIMIZATION WITH INTERMEDIATE STORAGE,
California Univ., Berkeley. Lawrence Berkeley Lab.; and California Energy and Environment Div.
J. Sathaye, and W. A. Hall.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. IR2, Proceedings paper No. 12180, p 249-264, June 1976. 3 fig, 4 tab, 4 ref.

Descriptors: *Aqueducts, *Irrigation, *Reservoirs, *Dynamic programming, Optimization, Mathematical models, Design, Planning, Systems analysis, Equations, Constraints, *Methodology, Size, Reservoir storage.
Identifiers: Benefit maximization, Cost function, Demand function.

A new method utilizing dynamic programming is presented for determining optimum aqueduct capacity with intermediate storage along the aqueduct. The method maximizes the net benefits and determines the optimum reservoir size once the reservoir has been selected by the planner. The model has been designed for development planning purposes, and it is presented in two sections. In the first section, the reservoir is located at the last downstream turnout. In the second section, a more general model is presented and the reservoir may be located at any one of the turnouts. A reduction in aqueduct capacity is achieved through storage regulation. Data for the model are only a 'test' data representative of existing water resources projects. The results indicate only the nature of the benefits and aqueduct reservoir capacities that may be achieved and are not applicable to any particular water resources project. (Bell-Cornell)
W76-09636

FLOOD PROBLEMS IN UTTAR PRADESH,
Uttar Pradesh Irrigation Dept., Lucknow (India).
A. C. Chaturvedi.
The Civil Engineer in South Africa, Vol. 17, No. 10, p 267-269, October 1975.

Descriptors: *Flood control, Rainfall, Drainage, Forecasting, Costs, Financing, Floods, Embankments, Flood protection, Erosion control, Reservoirs.
Identifiers: *Uttar Pradesh(India).

Uttar Pradesh, with a population of 95 million, is the largest state in India. Certain areas suffer from floods, while some others are hit by drought. Out of 55 districts, 11 districts were affected by floods and 30 districts by drought in 1974. The three dominant river systems, Ganga, Ghagra and Rapti, cause immense flooding in the plains. The Watal Committee 1939, the Inter-Provincial Flood Conference of 1939, and the U.P. Flood Committee 1948 have made very valuable suggestions. The State Flood Control Board was set up in 1964 for detailed examination of the flood problem and to devise measures for flood protection works, including marginal embankments, town protection schemes, raising of villages and antierosion works; flood forecasting is highly important. (Bell-Cornell)
W76-09640

HYDROLOGY FOR ENGINEERS, SECOND EDITION,
Stanford Univ., Calif.
For primary bibliographic entry see Field 8B.
W76-09661

METHODOLOGIES FOR THE DETERMINATION OF STREAM RESOURCE FLOW REQUIREMENTS: AN ASSESSMENT,
Utah State Univ., Logan. Dept. of Wildlife Science.
For primary bibliographic entry see Field 6G.
W76-09666

A REVIEW AND ANALYSIS OF SELECTED HYDROLOGIC MODELING CONCEPTS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2E.
W76-09718

EFFECTS OF LAND USE AND RIVER SEEPAGE ON GROUNDWATER QUALITY IN HALL COUNTY, NEBRASKA,
Nebraska Univ., Lincoln. Inst. of Agriculture; and Nebraska Univ., Lincoln. Div. of Natural Resources, Conservation and Survey.
For primary bibliographic entry see Field 5B.
W76-09728

OVERVIEW OF RAINFALL-RUNOFF PROCESS IN URBAN AREAS,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.

W76-09730

RUNOFF FREQUENCY PROCEDURE FOR SYNTHETIC HYDROGRAPH DEVELOPMENT,
Colorado Univ., Denver.
For primary bibliographic entry see Field 2A.
W76-09733

ILLUDAS - THE ILLINOIS URBAN DRAINAGE AREA SIMULATOR,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2E.
W76-09735

REMEDIAL MEASURES FOR URBAN FLOOD PEAK REDUCTION,
Georgia Inst. of Tech. Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-09736

A FLOOD MANAGEMENT MODEL FOR URBANIZING RIVER BASINS,
Massachusetts Inst. of Tech. Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W76-09737

AN APPLICATION OF THE STORM WATER MANAGEMENT MODEL,
Envirex Inc., Milwaukee, Wis. Environmental Sciences Div.
For primary bibliographic entry see Field 5D.
W76-09738

USE OF THE COMPUTER PROGRAM 'STORM' FOR ANALYSIS OF THE QUANTITY AND QUALITY OF URBAN STORM WATER RUNOFF,
Hydrologic Engineering Center. Davis, Calif.
For primary bibliographic entry see Field 5B.
W76-09740

PHYSICAL AND ECONOMIC ASPECTS ASSOCIATED WITH RUNOFF FROM URBAN GROWTH: A METHODOLOGICAL APPROACH,
Iowa Univ., Iowa City. Dept. of Economics.
For primary bibliographic entry see Field 4C.
W76-09749

MANAGEMENT OF FLOOD CONTROL AND DRAINAGE IN THE URBANIZING ZONE,
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
B. Van Weele.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 229-234, October 1974. 13 fig, 1 tab, 8 ref.

Descriptors: *Flood control, *Drainage, *Urban runoff, *Urbanization, Model studies, Mathematical models, Storm water, Storm runoff, Watersheds(Basins), Hydrology, Land use, Planning, Erosion, Sedimentation, Detention reservoirs, Cities.
Identifiers: *Fairfax County(Va).

Fairfax County, Virginia, is one of the fastest-growing counties in the United States and is therefore experiencing many and varied growing pains. One of these is flood control and drainage. Upon passage of a 'major storm' bond issue in 1971, the County elected to tackle the problems from two directions: (1) to prepare designs and start construction of facilities to alleviate many of the immediate problems that have been created because of urbanization, and (2) to implement plans for avoiding possible future flood control and drainage problems. The specific goals of the Fairfax County flood control and drainage program are to: (1) develop immediate solutions to existing flooding and channel erosion problems, (2) improve methods and procedures to develop budget projections for capital facilities for storm drainage, (3) establish a standard baseline from which to measure environmental change, (4) rewrite the drainage code and policy by incorporating a balance of on-site detention and off-site pro rata costs, and (5) make full utilization of the storm water runoff as a resource out of place. The 'heart' of the Fairfax County study is a tool that has been utilized to mathematically model the watershed runoff. This model is general-purpose rainfall-runoff simulation model, formulated in a problem-oriented computer language with a flexible command structure that permits selection of the many input/output and computational options available. (See also W76-09729) (Sims - ISWS)
W76-09750

MUNICIPAL STORM WATER MANAGEMENT PROGRAMS,
Lindley and Sons, Inc., Hinsdale, Ill.
R. W. Lindley, Jr.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 235-241, October 1974. 3 ref, 1 append.

Descriptors: *Storm water, *Urban runoff, *Legal aspects, *Urbanization, Detention reservoirs, Retention, Drainage systems, Cities, Schools(Education), Parks, Runoff, Floods, Flooding, Recreation, Land development, Land use, Construction, Water storage, Storm runoff, Planning.
Identifiers: *Naperville(Ill).

The City of Naperville, Illinois, is a rapidly growing community located in the western Chicago suburbs some 30 miles from the downtown Chicago area. The city has a population of approximately 28,000 and is divided by the West Branch of the Du Page River. The streets and associated pavement drainage systems were properly designed and have served the residents well over the past years. However, as the surrounding farmlands were transformed into single and multiple family residential subdivisions, it rapidly became apparent that the sewers designed to transport street and outlying farmland drainage were not adequate to transport urban runoff from highly populated residential areas. This report described the results of a four year effort by the City of Naperville, Illinois, the Naperville School District, the Naperville Park District and land development corporations to provide facilities for public education, recreation and storage of excess storm water runoff. Design paramenters utilized in the development of these areas were presented. An exerpt from the Storm Runoff Control Ordinance was appended. (See also W76-09729) (Sims - ISWS)
W76-09751

URBAN STORMWATER MANAGEMENT--PROBLEMS, SOLUTIONS AND IMPACT: A SUMMARY OF INTERVIEWS,
Poertner (Herbert G.), Bolingbrook, Ill.
For primary bibliographic entry see Field 4C.
W76-09752

A FLOODPLAIN MANAGEMENT FRAMEWORK WITH STRUCTURAL AND NON-STRUCTURAL MEASURES,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 6F.
W76-09754

IMPROVING WATER QUALITY BY CONTROL OF ALGAE: CELLULAR AND EXTRACELLULAR BLUE-GREEN ALGAL POLYSACCHARIDES,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5G.
W76-09760

HYDROELECTRIC POWER POTENTIAL AT CORPS OF ENGINEERS PROJECTS. RECOMMENDATIONS AND EXECUTIVE SUMMARY,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-09764

HYDROELECTRIC POWER POTENTIAL AT CORPS OF ENGINEERS PROJECTS,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-09765

LANDSLIDE HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst., of Behavioral Science.
For primary bibliographic entry see Field 6F.
W76-09781

REGRESSION ANALYSIS AND PARAMETER IDENTIFICATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W76-09824

HYDROLOGIC UNIT MAP--1974, STATE OF ALASKA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-09826

HYDROLOGIC UNIT MAP--1974, STATE OF OREGON,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-09827

APPRAISAL OF WATER RESOURCES OF NORTHWESTERN EL PASO COUNTY, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2E.
W76-09828

A PRIMER ON FLOODPLAIN DYNAMICS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-09831

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE MAJOR COAL AND OIL SHALE AREAS OF WYOMING, 1975-76,
Geological Survey, Cheyenne, Wyo.
Open-file report, January 1976. 43 p, 10 fig, 5 tab, 44 ref.

Descriptors: *Environmental effects, *Coal mines, *Oil industry, *Water resources, *Wyoming, Sampling, Sites, Streams, Reservoirs, Groundwater, Aquifers, Sediments, Water quality, Chemical analysis, Data collections, Monitoring, Water quality control, Water pollution control, Gaging stations, Observation wells.

The U.S. Geological Survey, in cooperation with the State of Wyoming and other Federal agencies,

has five data-collection activities and fourteen water-resource appraisal projects in the major coal and oil shale areas of Wyoming. These activities are located primarily in the Northern Great Plains coal region of northeastern Wyoming (the Powder River structural basin) and the Green River, Bear River, and Great Divide basins of southwestern Wyoming. The data-collection activities include: (1) Continuous records of streamflow and reservoir storage; (2) peak flow information at partial-record sites; (3) sampling and chemical analyses of water from streams and wells; (4) sampling and sediment analysis of water from streams; and (5) measurements of water levels in wells. This report contains lists of monitoring sites for these five data-collection activities. (Woodard-USGS)
W76-09833

NATIONAL CONFERENCE OF DISTRICT CHIEFS, ALBUQUERQUE, NEW MEXICO, SEPTEMBER 28-OCTOBER 3, 1975--PROCEEDINGS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2A.
W76-09838

A WATER-LAND USE MANAGEMENT MODEL FOR THE SEVIER RIVER BASIN PHASES I AND II,
Utah State Univ., Logan.
V. A. Narasimhan, and E. K. Israelsen.
Progress Report, PRWG150-1, Utah Water Research Laboratory, College of Engineering, Utah State University, Logan, Utah, September 1975. 44 p, 11 fig, 4 tab, 9 ref, append.

Descriptors: *Water resources development, *Land use, *River basins, *Management, Hydrology, *Simulation analysis, *Data collections, Reservoirs, Monthly, Costs, Feasibility, Data processing, Irrigation efficiency, *Utah, Alternative, Estimating, Mathematical models, Systems analysis.
Identifiers: Sevier River Basin(Utah).

The Utah Division of Water Rights and the Utah Water Research Laboratory have agreed jointly to evaluate the effects of installing more efficient irrigation conveyance and application systems on other users in the Sevier River Basin. As part of the first phase of the project, a hydrologic simulation model for the selected subbasins in the Sevier River Basin has been calibrated. The model considers large space increments on a monthly time increment. Additional data would improve the reliability of the model developed for some subbasins. The models resulting from the first phase of the study provide a functional tool for making management decisions in the Basin. In phase two of the study, a daily hydrologic model was calibrated to the Circle Valley Subbasin. In studying this short time and space increment model, the following modeling concepts were considered: in-basin use processes; canal diversions; irrigation efficiency; runoff components; data collection and processing; and model calibration. Data requirements for a daily model using small space increments seem to negate the possibility of the micromodel, at least for the present time. (Bell-Cornell)
W76-09844

A LINEAR PROGRAMMING MODEL FOR USE IN GUIDING URBAN FLOODPLAIN MANAGEMENT,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6F.
W76-09849

EFFECT OF SEQUENCE LENGTH N ON THE CHOICE OF ASSUMED DISTRIBUTION OF FLOODS,
IBM Thomas J Watson Research Center, Yorktown Heights, N. Y.
J. R. Wallis, N. C. Matalas, and J. R. Slack.
Water Resources Research, Vol. 12, No. 3, p 457-471, June 1976. 14 tab, 1 ref.

Descriptors: *Floods, *Distribution, Effects, *Length, Estimating, *Design flood, Equations, *Statistics, Systems analysis, *Flood frequency.
Identifiers: Optimal assumed distribution, Sensitivity.

Although overdesign and underdesign losses vary with the length n of flood sequences, the choice of flood frequency distribution for estimating the design flood is not overly sensitive to n. Bias in the estimate of the design flood does not account for differences in the analytical forms of the underlying and optimal assumed distributions of floods. (Bell-Cornell)
W76-09851

ESTIMATING SELECTED PARAMETERS FOR THE KENTUCKY WATERSHED MODEL FROM WATERSHED CHARACTERISTICS,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 2A.
W76-09852

LAND USE CHANGES AND RESERVOIR DEVELOPMENT: AN APPLICATION OF LAND USE INFORMATION SYSTEMS,
Oklahoma State Univ., Stillwater. Dept. of Geography.
Richard D. Hecock, and John F. Rooney.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 833, $6.00 in paper copy, $2.25 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, (1976). 113 p, 19 fig, 43 tab, 10 ref. OWRT B-031-OKLA(1). 14-31-0001-5106.

Descriptors: Reservoirs, Migration, *Land use, Remote sensing, Pre-impoundment, Social change, Zoning, Regional analysis, Resevoir siting, Information exchange.
Identifiers: Keystone Reservoir(Okla), Tulsa(Okla), Land use information systems.

This research examines the relationship between reservoir development and land use change. It focuses particularly on a series of pre-defined zones surrounding the Keystone Reservoir near Tulsa, Oklahoma. Land use changes were evaluated through time by means of various remote sensors and on site field investigation. The research concludes that a land use information system provides a useful means with which to evaluate regional land use changes. It also demonstrated profound differences in reservoir related land use changes between the construction and post construction periods. Four major land use fluctuation zones were discovered at increasing distances from reservoir disruption. The findings strongly suggest that future reservoir planners and developers must be made to account for the likely land use impacts during the pre-project period. Consideration should be given predictable land use changes in each of the four impact zones. Effects on future food supply and migration demand particularly careful evaluation.
W76-09905

POSSIBILITIES AND LIMITATIONS IN BIOLOGICAL CONTROL OF WEEDS,
Staatliches Museum fuer Naturkunde, Ludwigsburg (West Germany).
H. Zwoelfer.
Bull Oepp (Org Eur Mediterr Prot Plant). 3(3), p 19-30, 1973.

Descriptors: *Biocontrol, *Aquatic weed control, Europe, Environment, Insects, Weeds.
Identifiers: Ambrosia, Galinsoga, Phytophagous, Polygonum, Pteridium, Rumex, Solidago.

Biological weed control is the attempt to reduce the competitivity of a weed and to stabilize it at low population levels with the aid of herbivorous organisms (like insects) or phytopathogens. The main factors involved in the process of biological weed control are discussed. Biological weed control is compared to conventional control measures and its advantages as well as its limitations are studied. As a consequence of the interactions between a weed, its control agents and the environment, there are only relatively few weed species and weed situations in Europe which are promising targets for biological control programs. Some of these weeds are Solidago, Ambrosia, Polygonum, Galinsoga, Pteridium and Rumex spp.--Copyright 1974, Biological Abstracts, Inc.
W76-09920

RECENT TRENDS IN WEED CONTROL IN FRESHWATER,
Agricultural Research Council, Kidlington (England). Weed Research Organization.
T. O. Robson.
Bull Oepp (Org Eur Mediterr Prot Plant). 3(3), p 5-17, 1973.

Descriptors: *Aquatic weed control, *Biocontrol, *Chemcontrol, Methodology, Ecosystems, Weeds.

In many situations, such as irrigation and drainage ditches, the unobstructed movement of water is paramount and complete control of the weeds is needed. Most freshwater has many functions some of which involve biological systems in which weeds play an important part. Trends in the development of new weed control techniques aimed at replacing traditional hand cutting methods while maintaining the required condition of the water are briefly reviewed. These include mechanical, chemical and biological methods all of which contain potentially valuable tools for the management of freshwater ecosystems.--Copyright 1974, Biological Abstracts, Inc.
W76-09921

DEPENDENCE OF PASTURE GRASS YIELD ON SOIL MOISTURE LEVEL, (IN RUSSIAN),
Moskovskaya Selskokhozyaistvennaya Akademiya (USSR).
N. G. Andreev, V. A. Tyul'dyukov, and A. D. Prudnikov.
Dokl Vses (Ordena Lenina) Akad S-Kh Nauk Im V I Lenina. 4, p 2-4, 1974.

Descriptors: *Soil moisture, *Grasses, Irrigation, Pastures, Grasslands, *Crop production, Bromegrass, Fescues, Orchardgrass.
Identifiers: Alfalfa, Clover, Red clover, Timothy, USSR.

On irrigated pastures sown with brome, timothy, fescue, orchardgrass, red clover and alfalfa the best plant development was observed under conditions of the Moscow region (USSR) when the soil moisture content was 70% of field capacity, or 85% in especially dry years.--Copyright 1975, Biological Abstracts, Inc.
W76-09930

ST. LAWRENCE SEAWAY: A NEW GOAL OF YEAR-ROUND NAVIGATION,
ARCTEC, Inc., Columbia, Md.
For primary bibliographic entry see Field 2C.
W76-09942

SPECIFICATIONS FOR CONTAINER FACILITIES BY SIMULATION,
For primary bibliographic entry see Field 6A.
W76-09943

HYDROLOGIC FORECASTING FOR THE OHIO RIVER WATERWAY,
National Weather Service, Cincinnati, Ohio. River Forecast Center.
For primary bibliographic entry see Field 2E.
W76-09944

WAVE MOTIONS IN AN OFFSHORE HARBOR,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 8B.
W76-09947

USE OF MATHEMATICAL MODELS IN THE PALO ALTO MARSHLAND REHABILITATION PROJECT,
Water Resources Engineers, Walnut Creek, Calif.
For primary bibliographic entry see Field 8B.
W76-09949

NEAR-FIELD JET PENETRATION AND RESERVOIR MIXING,
Georgia Inst. of Technology, Atlanta.
For primary bibliographic entry see Field 8C.
W76-09962

PHYSICAL MODEL OF DISCHARGE IN A TWO-LAYER STRATIFIED AMBIENT,
Duke Power Co., Charlotte, N. C.
For primary bibliographic entry see Field 8B.
W76-09963

FORECASTS FOR THE SACREMENTO RIVER SYSTEM,
National Weather Service, Sacramento, Calif. River Forecast Center.
For primary bibliographic entry see Field 2E.
W76-09967

SEDIMENT DEPOSITION MODEL FOR TARBELA RESERVOIR,
Gilbert Associates, Inc., Reading, Pa.
For primary bibliographic entry see Field 2J.
W76-09970

PHYSICAL MODELING TECHNIQUES USED IN RIVER MODELS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. River Regulation Branch.
For primary bibliographic entry see Field 2E.
W76-09972

APPLICATION OF WATER QUALITY MODELS TO FINGER FILL CANALS,
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5B.
W76-09981

THE ERADICATION OF THE SEAWEED SARGASSUM MUTICUM FROM BRITAIN,
Portsmouth Polytechnic (England). Dept of Biological Sciences.
For primary bibliographic entry see Field 5G.
W76-09989

4B. Groundwater Management

THE OVER-EXPLOITATION OF GROUNDWATER RESOURCES IN DRY REGIONS,
Hebrew Univ., Jerusalem (Israel). Graduate School of Applied Science and Technology.
S. Mandel.
In: Symposium on Arid Zone Development: Potentialities and Problems, October 23-25, 1975, Boston. 22 p, 3 fig, 3 tab, 11 ref. (Processed)

Descriptors: *Groundwater resources, *Groundwater mining, *Overdraft, *Aquifers, *Water management(Applied), *Withdrawal, Surface-groundwater relationships, Aquifer management, Safe yield, Desalination, Subsidence, Hydrologic equation, Recycling, Social impact, Economic impact, Water policy, Arid lands.
Identifiers: *Israel, Wasting reserves.

Evaluations are presented of the main hydrologic and social problems related to over-exploitation of groundwater resources in dry regions. Even safe-yield exploitation eventually causes depletion of the groundwater reserves. Distinction is made between two types of over-exploitation, that of 'wasting reserves' (water lost during the transition from a natural to artificial replenishment equilibrium) and that of mining. Exploitation of the wasting reserves involves acceleration of the transition to an equilibrium state commensurate with the safe yield but no damage to the water resource, while groundwater mining causes resource damage by consuming more of the remaining reserves. Conditions which restrict mining include reservoir emptying, low water levels and consequent high pumping-lifts, water quality deterioration due to subsurface mechanisms or pollution from the surface, and soil subsidence. Alternative water resources and techniques to alleviate the eventual depletion of groundwater supplies are outlined. Social and economic impacts of over-exploitation are discussed and policy suggestions presented. A case history is offered concerning the Tel Aviv-Beersheva area of Israel, where exploitation of wasting reserves was successfully managed. Intensive development of the area was advanced by nine years and a social and technical infrastructure established with no long-term damage to groundwater resources. (Jahns-Arizona)
W76-09479

NEW TECHNOLOGIES IN WATER PURIFICATION AND THEIR APPLICATION TO ARID LANDS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 3A.
W76-09481

OPTIMAL GROUND WATER QUALITY MANAGEMENT: WELL INJECTION OF WASTE WATERS,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W76-09511

MONITORING WELLS,
Oregon State Engineer's Office, Salem.
H. R. Sweet.
Groundwater Report No. 19, October 1974. 39 p, 8 fig, 32 ref, 3 append.

Descriptors: *Observation wells, *Groundwater, *Monitoring, *Oregon, *Water quality, *Water levels, *Water level fluctuations, *Design criteria, Water table, Transmissivity, Hydraulic conductivity, Permeability, Storage coefficient, Specific yield, Potentiometric level, Lysimeters, Well casings, Well screens, Aquifer testing.
Identifiers: *Well design, *Gravel pack design, Well development, Suction lysimeter.

More than 100 water quality monitoring wells are in existence or under construction in Oregon. Reasons for, the theory behind, and methods of construction of typical water quality monitoring wells were summarized. Two examples of water quality monitoring were summarized. (Schicht - ISWS)
W76-09558

FIELD DRAINAGE WITH MANIFOLD WELL POINTS,
Agricultural Research Service, Weslaco, Tex.
For primary bibliographic entry see Field 5G.
W76-09586

INFLUENCE OF HYDRAULIC TROUGH AND LATERAL JOINTS ON THE GROUNDWATER POTENTIAL OF THE MASSIVE TRAP UNIT AT TANORIA IN SHAJAPUR DISTRICT (MP),
Central Ground water Board, Nagpur (India).
P. G. Adyalkar, and N. G. Gajbhiye.
Indian Journal of Power and River Valley Development, Vol. XXV, No. 3, p 98-100, March 1975. 1 fig.

Descriptors: *Hydraulics, *Groundwater resources, *Groundwater mining, Water supply, Geology, Structure, Recharge, Water quality.
Identifiers: Lateral joints, Hydraulics trough, Climate, Yield tests.

Massive trap units in the basaltic trappean terrain are generally the problematic areas posing special problems in locating even a meager quantity of groundwater for basic necessities of life. In such cases, location of hydraulic trough and the influence of lateral joints can be of considerable significance in prospecting for groundwater. Taking advantage of the local hydraulic trough and the lateral joints, the scope lies not only in fully meeting the local water supply of 175 klpd of Tanoria village in Shajapur district of Madhya Pradesh, but also in producing more water to meet the increasing use of the flourishing township under proper hydrogeological guidance and control. (Bell-Cornell)
W76-09614

INVESTIGATIONS INTO THE YIELD OF AN EXISTING SURFACE RESERVOIR AND AQUIFER SYSTEM,
Lancashire River Authority (England).
For primary bibliographic entry see Field 3B.
W76-09631

NITROGEN IN THE SUBSURFACE ENVIRONMENT,
East Central Oklahoma State Univ., Ada. School of Environmental Science.
For primary bibliographic entry see Field 5B.
W76-09662

UPWARD WATER MOVEMENT IN FIELD CORES,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-09726

EFFECTS OF LAND USE AND RIVER SEEPAGE ON GROUNDWATER QUALITY IN HALL COUNTY, NEBRASKA,
Nebraska Univ., Lincoln. Inst. of Agriculture; and Nebraska Univ., Lincoln. Div. of Natural Resources, Conservation and Survey.
For primary bibliographic entry see Field 5B.
W76-09728

HYDROLOGY OF THE MADISON FORMATION AND ITS POTENTIAL USE FOR WATER SUPPLY FOR ENERGY DEVELOPMENT,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2F.
W76-09757

GRAVITY GEOPHYSICS FOR GROUNDWATER EXPLORATION IN GLACIATED AREAS,
Michigan State University, East Lansing. Dept. of Geology.
R. S. Carmichael.

Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 542, $4.00 in paper copy, $2.25 in microfiche. Institute of Water Research, Michigan State University, July 1976. 35 p, 14 fig, 11 ref. OWRT A-076-MICH(1), 14-31-0001-5022.

Descriptors: *Alluvial channels, Bedrock, Gravity studies, Subsurface mapping, Groundwater, Computer models, Michigan, Indiana, Hydrogeology, Geophysics, Gravimetry, Glacial sediments, Exploration.
Identifiers: Bedrock exploration, Gravimeters, Glacial valleys, *Glacial deposits.

This project has helped develop and assess the applicability of the gravity geophysics method in groundwater prospecting. By mapping variations in the gravity field over the ground surface, one can define subsurface geologic structure such as buried stream valleys on the bedrock surface under glacial deposits. The research has involved definition of subsurface conditions and measurement errors that make the gravity method practical, and innovative data analysis techniques such as (1) using theoretical diurnal-tide gravity variation as part of the drift correction, and (ii) fitting a high-degree polynomial surface to data to compensate for elevation errors in reconnaissance surveys. The method has been demonstrated by performing field research studies for groundwater exploration that include Durand, Michigan (30 miles northeast of Lansing), Orion township, Mich. (70 miles east of Lansing), and Hartford City, Indiana (170 miles south of Lansing). The field studies and data analysis interpretation were done with the assistance of 22 students, and a consulting hydrology firm. The project has shown that the gravity method can be useful in finding groundwater in a number of geologic situations.
W76-09758

COMPUTER ESTIMATES OF NATURAL RECHARGE FROM SOIL MOISTURE DATA - HIGH PLAINS OF COLORADO,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W76-09761

CHARACTERIZATION OF NITROGEN SOURCES CONTAMINATING SHALLOW GROUND WATER IN AN ARID BASIN. LAS VEGAS AREA, NEVADA,
Nevada Univ., Reno. Center for Water Resources Research; and Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 5B.
W76-09762

HYDROLOGY AND SEDIMENTATION OF BIXLER RUN BASIN, CENTRAL PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 2J.
W76-09830

REPORT OF WATER LEVELS IN SELECTED OBSERVATION WELLS IN UTAH--APRIL 1976,
Geological Survey, Salt Lake City, Utah.
L. R. Herbert.
Geological Survey report, 1976. 5 p, 1 map.

Descriptors: *Water level fluctuations, *Groundwater, *Observation wells, *Basic data collections, *Utah, Hydrographs, Pumping, Groundwater recharge, Variability.

Information obtained by the U.S. Geological Survey from 14 selected observation wells in Utah during April 1975-March 1976 indicates that water levels were higher than the previous year in most wells. Water levels were lower in three wells in Sevier and Iron Counties. The month-end water levels for April 1975-March 1976 are shown by the hydrographs. They may be compared with average, highest, and lowest recorded water levels of record. On the index map the well symbol indicates the difference in water levels of April 1975-March 1976 with the previous year and with the average and extremes of record. Water-level trends extending from 1939 are shown by hydrographs of three wells in heavily pumped areas of southwestern Utah. (Woodard-USGS)
W76-09832

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE MAJOR COAL AND OIL SHALE AREAS OF WYOMING, 1975-76,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4A.
W76-09833

OPERATION AND MAINTENANCE OF A DEEP-WELL WATER-LEVEL MEASUREMENT DEVICE, 'THE IRON HORSE',
Geological Survey, Denver, Colo.
J. E. Weir, Jr., and J. W. Nelson.
Water-Resources Investigations 76-27, (open-file report), March 1976. 28 p, 8 fig, 2 ref.

Descriptors: *Instrumentation, *Water level recorders, *Deep wells, *Boreholes, *Water sampling, Methodology, Mechanical equipment, On-site tests, Mechanical control, Measurement.
Identifiers: Iron Horse, Assembly methods, Mechanical operation.

The deep-well investigative device--commonly called the Iron Horse--has been used extensively at the U.S. Energy Research and Development Administration's Nevada Test Site. The Iron Horse is used primarily for lowering and raising electrical water-level-measuring probes into and out of deep boreholes and wells. It can also be used for obtaining water samples, sounding depths, and determining vertical fluid velocity in a borehole. The device has proven especially useful for making measurements during prolonged hydraulic tests in wells where depths to water have been as great as 2,600 feet (792.5 metres). Assembly and general operation information of the Iron Horse is described. (Woodard-USGS)
W76-09835

GEOCHEMICAL AND ISOTOPIC ANALYSES OF WATERS ASSOCIATED WITH THE EDWARDS LIMESTONE AQUIFER, CENTRAL TEXAS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W76-09836

CENOZOIC DEPOSITS OF SOUTHEASTERN NEW MEXICO AND AN OUTLINE OF THE HISTORY OF EVAPORITE DISSOLUTION,
Geological Survey, Colo.
For primary bibliographic entry see Field 2J.
W76-09837

MATHEMATICAL MODEL OF FLOW IN A STREAM-AQUIFER SYSTEM,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-09966

NUCLEAR TECHNIQUES IN HYDROLOGICAL STUDIES,
Uppsala Univ. (Sweden). Dept. of Hydrology; and Uppsala Univ. (Sweden). Dept. of Physical Geography.
For primary bibliographic entry see Field 2F.
W76-09996

4C. Effects On Water Of Man's Non-Water Activities

RE-EVALUATION OF THE EFFECTS OF MAN-MADE MODIFICATIONS ON GORDON CREEK BETWEEN 1887 AND 1973 AND ESPECIALLY AS REGARDS ITS FISH FAUNA,
Ohio State Univ., Columbus.
M. B. Trautman, and D. K. Gartman.
Ohio J Sci. 74(3); p 162-173, 1974.

Descriptors: *Streams, *Ohio, Channels, Carp, *Water pollution effects, *Fish, Minnows, Pikes, Perch, Suckers, Bullheads, Sunfishes, Bass, Darters.
Identifiers: Channelization, *Creeks, *Gordon Creek, Matumee River(Ohio), Grass pickerel, Goldenshiner, Chub, Mimic shiner, Tadpole, *Madtom, Pirateperch, Shiners, Johnny darter, Bluegill.

Gordon Creek, a tributary of the Matumee River in northwestern Ohio was investigated in 1887, 1929-38, 1954,and in 1973. Dredging and ditching in this area were begun about 1850, continuing until the present, with major channelization occurring in 1935. Channelization, together with the effects of dams and pollution, has had a major effect on the fish species present in this stream. The central mudminnow (Umbra limi), grass pickerel (Esox americanus vermiculatus), goldenshiner (Notemigonus crysoleucas), hornyhead chub (Nocomis biguttatus), mimic shiner (Notropis volucellus), tadpole madtom (Noturus gyrinus), and pirateperch (Aphredoderus sayanus) all require clean static or flowing water, rooted aquatic vegetation, sand and gravel substrates, and/or well-defined riffles and pools. These species have been largely reduced in population abundance or have been extirpated in part or entirely by the destruction of their habitants by channelization. In contrast, the creek chub (Semotilus atromaculatus), common shiner (Notropis cornutus), and spotfin shiner (N. spilopterus) are tolerant of a more or less uniform current flow, such as produced by channelization, and are therefore rather generally distributed and remain numerous. The silverjaw minnow (Ericymba buccata) and Johnny darter (Etheostoma nigrum) were recorded in greatest numbers over gravel-sand substrates. The carp (Cyprinus carpio), fathead minnow (Pimephales promealas), bluntnose minnow (P. notatus), common sucker (Catostomus commersoni), yellow bullhead (Ictalurus natalis), and green sunfish (Lepomis cyanellus) occurred most numerously in undredged pools or in pools largely recovered from former ditching; these pools were with or without currents, undercut banks, fallen timbers and brush heaps, and had various types of substrates. The large-mouthed blackbass (Micropterus salmoides), bluegill (L. macrochirus), suckermouth minnow (Phenacobius mirabilis), and orangespotted sunfish (L. humilis), asent in 1887, have been inadvertently introduced or have invaded the area. In some sections, riffles and pools have become partially reestablished since the last channelization, resulting in isolated small populations of such species as the orangethroat darter (Etheostoma spectabile).--Copyright 1975, Biological Abstracts, Inc.
W76-09407

ADDITIONAL OBSERVATIONS ON THE EFFECTS OF STRIP MINING ON SMALL-STREAM FISHES IN EAST-CENTRAL KENTUCKY,
Eastern Kentucky Univ., Richmond. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W76-09468

CHANGES IN WATER CHEMISTRY RESULTING FROM SURFACE-MINING OF COAL ON FOUR WEST VIRGINIA WATERSHEDS,
Forest Service (USDA), Berea, Ky. Northeast Forest Experiment Station.
W. T. Plass.
In: Third Symposium on Surface Mining and Reclamation, Vol. I, 1975, October 21-23, Louisville, Kentucky. p 152-169. 6 tab, 5 ref, 10 fig.

Descriptors: *Strip mines, *Water quality, Streams, Water chemistry, Appalachian Mountain region, *West Virginia, Water pollution sources, *Mine wastes, Water pollution control.

The nature and extent of change in water quality resulting from present day mining and reclamation methods is important to the maintenance of aquatic flora and fauna and to downstream water users. Investigations comparing water quality parameters from watersheds before mining with the same parameters after mining showed significant variation between growing and dormant seasons as well as from year to year. After mining, eight of twelve chemical elements describing water chemistry increased as weathering processes released chemical components of the overburden rock. During the initial three-year post-mining period, pH, specific conductance, alkalinity, bicarbonate, and zinc increased from year to year at a uniform rate. Sulfate, calcium, and magnesium increased at an accelerating rate from year to year. (Forest Service)
W76-09470

FOREST MANAGEMENT PRACTICES AS RELATED TO NUTRIENT LEACHING AND WATER QUALITY,
Northeastern Forest Experiment Station, Pennington, N. J.
E. S. Corbett, J. A. Lynch, and W. E. Sopper.
In: Proceedings Conference on Non-Point Sources of Water Pollution, May 1-2, 1975, Blacksburg, Virginia, Virginia Water Resources Research Center, Virginia Polytechnic Institute and State University, 1975, p. 157-173.

Descriptors: *Cycling nutrients, *Nutrients, *Nitrates, *Clear-cutting, *Water temperature, *Turbidity, *Leaching, Watersheds(Basins), Aquatic environment, Freshwater fish, Water pollution sources, Erosion, Herbicides, Vegetation regrowth, Calcium, Magnesium, Potassium, Sodium sulfate, *Forest management.
Identifiers: Non-Point water pollution, Stream nutrient concentration, Buffer strips, Timber harvesting, Controlling stream temperatures.

The effects of forest-management practices on water quality in the Eastern United States are reviewed. Changes in stream nutrient concentrations, water temperature, turbidity and sedimentation are quantified. Stream nutrient and temperature gradients from the headwaters to the mouth of both forested and clearcut watersheds are evaluated. (Forest Service)
W76-09471

THE SAHELIAN DROUGHT AND ITS DEMOGRAPHIC IMPLICATIONS,
Australian National University, Canberra, Department of Demography.
For primary bibliographic entry see Field 6G.
W76-09486

AN ASSESSMENT OF ESTUARINE AND NEARSHORE MARINE ENVIRONMENTS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 6G.
W76-09665

NATIONAL SYMPOSIUM ON URBAN RAINFALL AND RUNOFF AND SEDIMENT CONTROL,
Kentucky Univ. Lexington, Coll. of Engineering.
Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, University of Kentucky, Office of Research and Engineering Services, October 1974. 246 p. Kao, D.T.Y., editor.

Descriptors: *Urbanization, *Storm runoff, *Erosion control, *Sediment control, Runoff, Erosion, Sedimentation, *Rainfall, Construction, Urban runoff, Cities, Retention, Detention reservoirs, Flooding, Sewers, Combined sewers, Separated sewers, Drainage, Drainage systems, Precipitation(Atmospheric).

The papers of this symposium covered a variety of problems arising from runoff changes due to urbanization. One paper reported the distribution of heavy rainfall in a major urban area, and suggested that the urban area may have an effect on the distribution. Other papers covered ways to control increased runoff due to urbanization. Drainage systems, detention basins, and flooding were discussed. Means of controlling the increased erosion and sedimentation were described. Construction was shown to be one of the most important causes of increased erosion. The problems of separated and combined sewers were discussed. (See W76-09730 thru W76-09752) (Sims-ISWS)
W76-09729

OVERVIEW OF RAINFALL-RUNOFF PROCESS IN URBAN AREAS,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W76-09730

OVERVIEW OF THE URBAN EROSION AND SEDIMENTATION PROCESSES,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
L. D. Meyer.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 15-23, October 1974. 8 fig, 36 ref.

Descriptors: *Erosion, *Urban runoff, *Soil erosion, *Sedimentation, Reviews, Runoff, Rill erosion, Channel erosion, Erosion rates, Erosion control, Sediments, Construction, Cities, Urban drainage, Urban hydrology, Hydrology.

Public concern and legislation are forcing responsible officials to face urban erosion and sedimentation problems. Results of agricultural research, especially the Universal Soil-Loss Equation and simulated-rainfall studies of erosion-control practices for denuded land, are major sources of applicable information. Disseminating and adapting available knowledge promises to hasten the development of effective solutions to these major urban environmental problems. (See also W76-09729) (Sims - ISWS)
W76-09731

RELATIONSHIP OF RATIONAL AND UNIT GRAPH METHODS IN RETENTION BASIN DESIGN,
Army Engineer District, Louisville, Ky.
L. Curry Jr.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 33-40, October 1974. 3 ref.

Descriptors: *Retention, *Runoff, *Urban runoff, Storage, Basins, Urban hydrology, Hydrographs, Drainage, Design data, Design storm, Rainfall, Precipitation(Atmospheric), Frequency curves, Hydrology, Urbanization.

The use of on-site retention basins in now recognized as a practical method of alleviating adverse effects of urban development on existing drainage facilities. A typical case occurs when a proposed development such as an apartment complex on land recently rezoned must discharge storm runoff into the storm system of an existing development of single family residences. If the existing storm system was designed to handle runoff from the undeveloped tract, based on single family use, it would be overloaded by the proposed development. Therefore a retention basin must be designed to reduce the peak of the future development's runoff to that previously assumed. In order to design such a basin, any private engineers and engineering firms will be dealing with runoff volumes for the first time in addition to runoff peaks with which they are fairly familiar. The most critical problem is to make their runoff volume computations compatible with runoff peaks based on the widely accepted rational method. This paper presented techniques for using the unit hydrograph method and storage routing (normally used for design of dams and spillways) to obtain results on a small scale compatible with those of the rational method. (See also W76-09729) (Sims - ISWS)
W76-09732

RUNOFF FREQUENCY PROCEDURE FOR SYNTHETIC HYDROGRAPH DEVELOPMENT,
Colorado Univ., Denver.
For primary bibliographic entry see Field 2A.
W76-09733

THE DISTRIBUTION OF HEAVY RAINFALL IN A MAJOR URBAN AREA,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W76-09734

ILLUDAS - THE ILLINOIS URBAN DRAINAGE AREA SIMULATOR,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2E.
W76-09735

REMEDIAL MEASURES FOR URBAN FLOOD PEAK REDUCTION,
Georgia Inst. of Tech. Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-09736

A FLOOD MANAGEMENT MODEL FOR URBANIZING RIVER BASINS,
Massachusetts Inst. of Tech. Cambridge. Dept. of Civil Engineering.
P. H. Kirshen, and D. H. Marks.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 93-107, October 1974. 3 fig, 2 tab.

Descriptors: *Model studies, *Flood control, *Land use, *Urbanization, Mathematical models, Rivers, Basins, Watersheds(Basins), Reservoirs, Runoff, Flow, Channel flow, Population, Urban hydrology, Planning, *Puerto Rico.

A mixed integer programming screening model was formulated to be used in flood control and related land use planning in Puerto Rico. The model gave some preliminary answers to the questions of what river control devices should be used in the basin such that flooding is controlled, population requirements are met, and multiple objectives for preferential land use, damage aversion and structural cost minimization are optimized. The model

was designed to be used in conjunction with catchment simulation models. After the model was formulated it was applied to a hypothetical river basin and the results were discussed. (See also W76-09729) (Sims - ISWS)
W76-09737

AN APPLICATION OF THE STORM WATER MANAGEMENT MODEL,
Envirex Inc., Milwaukee, Wis. Environmental Sciences Div.
For primary bibliographic entry see Field 5D.
W76-09738

IS THE SEPARATION OF SEWERS DESIRABLE,
Hydrotechnic Corp., New York.
For primary bibliographic entry see Field 5D.
W76-09739

USE OF THE COMPUTER PROGRAM 'STORM' FOR ANALYSIS OF THE QUANTITY AND QUALITY OF URBAN STORM WATER RUNOFF,
Hydrologic Engineering Center. Davis, Calif.
For primary bibliographic entry see Field 5B.
W76-09740

COMBINED SEWAGE OVERFLOWS - FREQUENCY, ENVIRONMENTAL EFFECTS, AND A CORRECTIVE PROGRAM,
Clinton Bogert Associates, Fort Lee, N. J.
For primary bibliographic entry see Field 5D.
W76-09741

EVALUATION AND CONTROL OF SOIL EROSION IN URBANIZING WATERSHEDS,
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
For primary bibliographic entry see Field 4D.
W76-09742

EROSION CONTROL DURING PIPELINE CONSTRUCTION,
Yule, Jordan and Associates, Camp Hill, Pa.
For primary bibliographic entry see Field 5G.
W76-09743

THE INFLUENCE OF URBANIZATION ON STREAM CHANNEL BEHAVIOR,
State Univ. of New York at Buffalo. Dept. of Civil Engineering.
R. P. Apmann.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 183-188, October 1974. 12 ref.

Descriptors: *Streams, *Channel flow, *Urbanization, Channels, Streamflow, Erosion, Sedimentation, Sediments, Channel morphology, Channel erosion, Shape, Slopes, Width, Runoff, Hydraulics.
Identifiers: *Channel behavior, Hydraulic geometry.

A method was proposed for evaluating the impact of urban development on stream channel behavior. The method was based on equations relating the hydraulic geometry to mean flow discharges. Urban development can result in stream channel enlargement in affected watersheds with consequent production of sediments from the channel. If development proceeds for a long time, channel instability may be a continuing problem. In the first approximation, the rate of channel sediment production and the ultimate channel size can be evaluated from equations derived from the hydraulic geometry relations for a stream. As an example, a channel in a watershed changing from natural conditions to an urbanized area having 30% impervious area would enlarge by a factor of about 2.8 times in the process. Another example indicated that the steady development of the Cuyahoga River Basin, Ohio, is responsible for a sediment production of about 40,000 tons/year from the channel between Old Portage and Independence, a distance of 31 miles. (See also W76-09729) (Sims - ISWS)
W76-09744

CHANGES IN THE SEDIMENTATION CHARACTERISTICS OF AN URBANIZING WATERSHED, DALLAS AND COLLIN COUNTIES, TEXAS,
Texas Dept. of Community Affairs, Austin.
E. V. Diniz, and W. L. Moore.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 189-198, October 1974. 10 fig, 4 tab, 36 ref.

Descriptors: *Sedimentation, *Urbanization, *Reservoirs, *Storage capacity, *Texas, Erosion, Reservoir storage, Lakes, Watersheds(Basins), Rainfall, Precipitation(Atmospheric), Evaporation, Runoff, Slopes, Slope stability, Surveys, Sediments, Cities, Sedimentology.
Identifiers: *White Rock Lake(Tex), *White Rock Creek(Tex), Dallas(Tex).

White Rock lake, on White Rock Creek, in Dallas and Collin Counties, Texas has a sediment contributing area of 97.4 sq mi, of which over 55% is urbanized. Storage of water in White Rock Lake was started in 1910. The effects of continuing urbanization on the sedimentation characteristics of the watershed were studied by use of three sedimentation surveys conducted in April 1935, March 1956, and October 1970. The relationships among reservoir capacity loss, sediment density, reservoir trap efficiency, watershed climate, and watershed land use were analyzed. In spite of an increasing reservoir capacity loss and an increase in average annual rainfall, it was found that the average dry weight of sediment in lbs per cu ft decreased with increasing urbanization. In the case of White Rock Creek, urban sediment created localized problems, but did not cause increased sediment production for the total watershed. (See also W76-09729) (Sims - ISWS)
W76-09745

PREDICTING SEDIMENT YIELD IN URBAN AREAS,
Soil Conservation Service, College Park, Md.
For primary bibliographic entry see Field 4D.
W76-09746

LEGAL APPROACHES TO CONTROL RUNOFF AND SEDIMENTATION: A CASE STUDY OF GEORGIA,
The Research Group, Inc., Atlanta, Ga.
For primary bibliographic entry see Field 4D.
W76-09747

WATERSHED MANAGEMENT AND SEDIMENT CONTROL IN MONTGOMERY COUNTY,
Environmental Protection Agency, Montgomery County, Md. Storm Water Management Section.
For primary bibliographic entry see Field 4D.
W76-09748

PHYSICAL AND ECONOMIC ASPECTS ASSOCIATED WITH RUNOFF FROM URBAN GROWTH: A METHODOLOGICAL APPROACH,
Iowa Univ., Iowa City. Dept. of Economics.
J. R. Barnard, and T. E. Croley, II.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 219-228, October 1974. 1 fig, 32 ref.

Descriptors: *Model studies, *Runoff, *Economics, *Iowa, *Urbanization, Mathematical models, Watersheds(Basins), Hydrology, Urban runoff, Floods, Flooding, Hazards, Property values, Flow, Streamflow, Storm water, Flood plains, Hydrologic properties, Urban hydrology, Methodology, Analytical techniques.
Identifiers: *Iowa City(Iowa).

Urban growth often impinges upon local watersheds resulting in alteration of the frequency and magnitude of flooding along small creeks and low areas. Urban development generally takes place within the context of governmental intervention through land use zoning and planning with the explicit purpose being to protect property rights. In spite of land use regulation, urban growth frequently produces negative externalities in the form of increased frequency and magnitude of flood hazard. This paper presented the methodology for examining the physical and economic aspects of urban growth in a local watershed. Specifically, the Stanford Watershed Hydrologic Model was further developed for statistically determining the impact of urbanization upon flooding frequency and magnitude. The results from the hydrologic model were linked to an economic model to determine the extent that negative externalities impinge upon property as a result of urbanization and change in frequency and magnitude of flooding. An analysis of the property market is central to the issue of determining the effect of the changes in flooding hazard on property values and the extent of negative externalities upon property owners and possible income distribution effects. (See also W76-09729) (Sims - ISWS)
W76-09749

MANAGEMENT OF FLOOD CONTROL AND DRAINAGE IN THE URBANIZING ZONE,
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
For primary bibliographic entry see Field 4A.
W76-09750

MUNICIPAL STORM WATER MANAGEMENT PROGRAMS,
Lindley and Sons, Inc., Hinsdale, Ill.
For primary bibliographic entry see Field 4A.
W76-09751

URBAN STORMWATER MANAGEMENT--PROBLEMS, SOLUTIONS AND IMPACT: A SUMMARY OF INTERVIEWS,
Poertner (Herbert G.), Bolingbrook, Ill.
W. W. Gast.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 243-246, October 1974.

Descriptors: *Storm water, *Urban runoff, *Water management(Applied), *Urbanization, Storm runoff, Flood control, Cities, Economics, Legal aspects, Planning, Detention reservoirs, Erosion, Sedimentation, Drainage, Hydrology, *Surveys.
Identifiers: Interviews.

Interviews of participants in the National Symposium on Urban Rainfall and Runoff and Sediment Control were conducted at the University of Kentucky, Lexington, during the period July 29-31, 1974. The purpose was to obtain information concerning significant and typical problems that impede or prevent the development of effective and economical stormwater management programs and facilities in urban and metropolitan areas of the United States. Information was also

sought concerning solutions to these problems and the impact of stormwater management programs. Problems that were identified as impediments to establishing sound and sensible stormwater management programs were evident in many of the interviews. These included inadequate local and state laws, a dearth of information on legal aspects of stormwater management, the difficulty of obtaining needed legislation and authority, and unsatisfactory interaction between various governmental jurisdictions. Many urban governments have ordinances and regulations to control runoff, but many are not written clearly enough to avoid different interpretations by users and, at times, by personnel of the regulatory agencies. Most of those interviewed felt that the major objective in solving local runoff problems should be to develop a set of understandable criteria that are specific, yet flexible, and which can be used by all communities in an urban area or region to regulate the planning, construction, operation, and maintenance of all stormwater control facilities. (See also W76-09729) (Sims - ISWS)
W76-09752

SECONDARY EFFECTS OF PUBLIC INVESTMENTS IN HIGHWAYS AND SEWERS.
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5G.
W76-09778

THE ERODIBILITY OF PUMICE SOILS OF THE NORTH ISLAND, NEW ZEALAND,
Waikato Univ., Hamilton (New Zealand). Dept. of Earth Sciences.
For primary bibliographic entry see Field 4D.
W76-09787

ANTHROPOGENIC EFFECT ON CONTINENTAL, MARINE, AND OCEANIC BIOHYDROCOENOSES, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W76-09819

STORM-PERIOD VARIABLES AFFECTING SEDIMENT TRANSPORT FROM URBAN CONSTRUCTION AREAS,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 2J.
W76-09840

URBAN-AREA SEDIMENT YIELD--EFFECTS OF CONSTRUCTION-SITE CONDITIONS AND SEDIMENT-CONTROL METHODS,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 4D.
W76-09841

4D. Watershed Protection

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: PENN STATE EXPERIMENTAL WATERSHEDS,
Pennsylvania State Univ., University Park. School of Forest Resources.
J. A. Lynch, W. E. Sopper, E. S. Corbett, and D. W. Aurand.
In: Municipal Watershed Management Symposium Proceedings, USDA Forest Service, General Technical Report NE-13, 1975, p 32-46.

Descriptors: *Water yield, *Clear-cutting, *Hydrograph analysis, *Low flow, *Turbidity, *Water temperature, Rainfall-runoff relationships, Streamflow, Water quality, Nutrients, Storm runoff, Peak flow, Acidity, Experimental watersheds, Flow augmentation, Pennsylvania, Watershed management.
Identifiers: *Flow duration, Seasonal water yield, Monthly water yield, Quickflow, Hydrograph recession.

The results of phase one and phase two of a three-phase clearcutting experiment on a 106-acre watershed in central Pennsylvania are reported. Phase one involved the removal of the vegetative cover on 21.3 acres of the lower-slope portion of the watershed. Phase two consisted of clearcutting an additional 27.0 acres on the middle-slope portion of the watershed. The effects of these treatments on water quality, quantity, and streamflow timing have been evaluated. Water quality parameters investigated include turbidity, temperature, acidity, and selected nutrients. Water quantity data were evaluated on monthly, seasonal, and annual bases. Quickflow volume, instantaneous maximum peak, time to peak, time of recession, and antecedent flow rate of storm hydrographs were also investigated. (Forest Service)
W76-09463

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: BALTIMORE, MARYLAND, MUNICIPAL WATERSHEDS,
Northeastern Forest Experiment Station, Pennington, N.J.
E. S. Corbett, and W. Spencer.
In: Municipal Watershed Management Symposium Proceedings, USDA Forest Service, General Technical Report NE-13, 1975, p 25-31.

Descriptors: *Water yield, *Rainfall-runoff relationships, *Antecedent precipitation, *Watershed management, *Erosion, Reforestation, Turbidity, Water temperature, Water quality, Hydrologic aspects, Experimental watersheds, Forest management, Cities, Maryland.
Identifiers: *Municipal watersheds, Land use change, Watershed policies, Thinning, Single-watershed calibration analysis, Piedmont, Baltimore(Maryland).

To complement its water-management program, the City of Baltimore, with the assistance of the Northeastern Forest Experiment Station, is conducting research on the effects of vegetation management on water yield and quality. Three small watersheds, ranging in size from 22 to 38 acres, have been selected for this purpose. Two of the watersheds, formerly in open land except for hardwoods along the riparian zones, were reforested 17 years ago with white and loblolly pines. Converting the open land to a pine forest caused a substantial reduction in water yield. The effects of removing riparian-zone vegetation and also thinning the young pine plantations are evaluated from the viewpoint of the municipal watershed manager. (Forest Service)
W76-09464

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: NEWARK, NEW JERSEY, MUNICIPAL WATERSHEDS,
Northeastern Forest Experiment Station, Pennington, N.J.
E. S. Corbett, and J. H. Heilman.
In: Municipal Watershed Management Symposium Proceedings, USDA Forest Service, General Technical Report NE-13, 1975, p 47-57.

Descriptors: *Water yield improvement, *Water shortage, *Water storage, *Flow characteristics, Droughts, Experimental watersheds(Basins), Rainfall-runoff relationships, Reservoirs, Low flow, Peak discharge, Water quality, Water supply, Municipal water, Herbicides, Water temperature, Turbidity, Recreation, Aesthetics, *Watershed management, *New Jersey.
Identifiers: Defoliation, Gypsy moth, Streamflow timing, Streamside vegetation, *Municipal watersheds, Newark(NJ), *Pequannock Watershed(NJ).

The 36,000-acre Pequannock Watershed, owned by the City of Newark, New Jersey, provides about one-half of the water supply of Newark and adjacent cities. The collection and delivery of high-quality water to the city is the primary management objective. The Newark Division of Water Supply and the Northeastern Forest Experiment Station in 1959 initiated a cooperative study of the effects of chemical control of vegetation on water quality and yield. Three forested watersheds (oak-hickory type) in the Pequannock drainage, ranging from 24 to 68 acres, were used. Riparian zone vegetation was deadened on one watershed with herbicides (using tree injection and mist-blower application) to stimulate a streamside treatment that has been practiced on the Pequannock in the past. Herbicides were used to deaden overstory vegetation on another watershed. The effects of gypsy moth defoliation on water yield are quantified. The use of vegetation treatments in the management of a municipal watershed is discussed. (Forest Service)
W76-09465

SUMMARY OF MUNICIPAL WATERSHED MANAGEMENT SURVEYS IN EASTERN UNITED STATES,
Southeastern Area State and Private Forestry, Atlanta, Ga.
G. E. Dissmeyer, E. S. Corbett, and W. T. Swank.
In: Municipal Watershed Management Symposium Proceedings, USDA Forest Service, General Technical Report NE-13, 1975, p. 185-192.

Descriptors: *Land management, *Watersheds(Basins), Surface waters, Hydrologic data, Water quality, Water yield, Vegetation, Recreation, Forest watersheds, Northeast U.S., Southeast U.S., *Watershed management, Water management(Applied).
Identifiers: *Municipal watershed surveys, Information needs, Land ownership, Problem areas, Information dissemination.

The U. S. Forest Service conducted two municipal watershed management surveys in the eastern United States, using mailed questionnaires, to (1) determine the importance of surface water supplies, (2) inventory the land uses allowed in these watersheds, (3) inventory the nature and extent of various land-management problems related to water supplies, and (4) determine what information and management practices are needed to improve watershed management and water supplies. Results are presented. (Forest Service)
W76-09466

WATERSHED RESPONSE TO PARTIAL AREA APPLICATIONS OF SIMULATED RAINFALL,
Northeastern Forest Experiment Station, Pennington, N. J.
For primary bibliographic entry see Field 2A.
W76-09467

REQUIREMENTS AND USE OF FERTILIZER, LIME, AND MULCH FOR VEGETATING ACID MINE SPOILS,
Forest Service (USDA), Berea, Northeastern Forest Experiment Station.
W. G. Vogel.
In: Third Symposium on Surface Mining and Reclamation, Vol. II, October 21-23, 1975, Louisville, Kentucky. p 152-170, 8 tab, 13 ref.

Descriptors: *Strip mines, *Mulching, *Fertilizers, *Lime, Vegetation establishment, Appalachian Mountain region, *Acidic soils, Moisture availability, Mine drainage, Kentucky, Evaporation, Root zones, Regrowth.

Mulch, in addition to lime and N and P fertilizers, was required for successful establishment of grasses and legumes seeded on extremely acid spoils (pH 2.2 to 3.5) in eastern Kentucky. With only lime and fertilizer, a sparse vegetative cover (mostly grass) became established; but where a mulch of shredded bark also was applied, a good cover of grasses and legumes was established. The

plants were rooted only in the layer of spoil into which the lime had been incorporated (2 to 4 inches deep). The mulch reduced evaporation and maintained moisture in this rooting zone. (Forest Service)
W76-09469

MUNICIPAL WATERSHED MANAGEMENT: WHAT ARE THE OPPORTUNITIES,
Northeastern Forest Experiment Station, Pennington, N. J.
E. S. Corbett, W. E. Sopper, and J. A. Lynch.
In: Forestry Issues in Urban America. Society of American Foresters National Convention Proceedings, September 22-26, 1974, New York, N. Y., 1975, p. 50-57.

Descriptors: *Watershed management, *Land management, Resource allocation, Recreation, Urbanization, Public Health, Aesthetics, Municipalitis, Waste water disposal, Forestry, Water quality, Cities, Northeast U. S., *Water supply, Multiple-purpose projects.
Identifiers: *Municipal watersheds.

Urban areas require large amounts of water to satisfy both domestic and industrial needs. In the United States many communities obtain their water supply from municipal watersheds. In the highly urbanized Northeast over two million acres of land are under the control of municipalities, private water companies, and State and Federal agencies for management as either water-source areas or protection land for municipal water supply. In many urban areas, municipal watersheds are the only large forested tracts remaining. They are valuable community assets. Municipal watersheds can provide many goods and services to the urban American in addition to a supply of high quality water. These benefits are enumerated and management constraints evaluated from the viewpoint of both the urban resident and the watershed manager. (Forest Service)
W76-09472

CONCEPTUAL HYDROLOGICAL MODEL FOR AN AVERAGED-SIZED CATCHMENT AREA, I. CONCEPTS AND RELATIONSHIPS,
Institut Royal Meteorologique de Belgique, Brussels. Hydrology Section.
For primary bibliographic entry see Field 2A.
W76-09579

CONCEPTUAL HYDROLOGICAL MODEL FOR AN AVERAGE-SIZED CATCHMENT AREA, II. ESTIMATE OF PARAMETERS, VALIDITY OF MODEL, APPLICATION,
Institut Royal Meteorologique de Belgique (Brussels). Hydrology Section.
For primary bibliographic entry see Field 2A.
W76-09580

A PROCEDURE FOR ESTIMATING OFF-SITE SEDIMENT DAMAGE COSTS AND AN EMPIRICAL TEST,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4A.
W76-09632

NATIONAL SYMPOSIUM ON URBAN RAINFALL AND RUNOFF AND SEDIMENT CONTROL,
Kentucky Univ. Lexington, Coll. of Engineering.
For primary bibliographic entry see Field 4C.
W76-09729

OVERVIEW OF THE URBAN EROSION AND SEDIMENTATION PROCESSES,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 4C.
W76-09731

EVALUATION AND CONTROL OF SOIL EROSION IN URBANIZING WATERSHEDS,
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
C-N. Chen.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 161-173, October 1974. 14 fig, 4 tab, 22 ref.

Descriptors: *Soil erosion, *Urbanization, *Erosion control, Watersheds(Basins), Construction, Sediments, Sedimentation, Suspended solids, Soils, Rainfall, Runoff, Erosion rates, Slope protection, Cities, *Virginia.
Identifiers: *Fairfax County(Va), *Urban watersheds, Sediment basins.

The natural processes of water-borne sedimentation generally consist of three basic elements - erosion, transportation, and deposition of soil by the action of rainfall, runoff, and gravity. The natural equilibrium of the sedimentation processes can be severely upset through man's uncontrolled land development activities. During urbanization or suburbanization involving construction activities, acceleration of the erosion process occurs as land surfaces are denuded and exposed to rainfall and runoff. As a result, transport and deposition of sediments in excessive quantities cause damages to downstream environments. In this paper, results of our current study for the County of Fairfax, Virginia, on setting erosion control criteria and on establishing the methodology for on-site erosion control were presented. The quantitative information on overland soil erosion and stream sediment concentration was established on the basis of field data collected from neighboring watersheds in the metropolitan area of Washington, D.C., and Baltimore, Maryland. Although the study was performed with the aim of achieving overall erosion control in the Fairfax County area, the concept and the methodology developed in this study are believed to be universally applicable to other urbanizing watersheds. The soil erosion rates from construction sites were determined to range from 50 to 200 t/a/yr while those from non-construction areas ranged between 1 and 3 t/a/yr. (See also W76-09729) (Sims - ISWS)
W76-09742

EROSION CONTROL DURING PIPELINE CONSTRUCTION,
Yule, Jordan and Associates, Camp Hill, Pa.
For primary bibliographic entry see Field 5G.
W76-09743

PREDICTING SEDIMENT YIELD IN URBAN AREAS,
Soil Conservation Service, College Park, Md.
S. M. Boysen.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 199-203, October 1974. 3 fig, 5 ref.

Descriptors: *Sediment yield, *Urbanization, *Erosion, Forecasting, Trap efficiency, Retention, Reservoirs, Sediments, Sedimentation, Sedimentation rates, Erosion control, Sediment control, Deposition(Sediments), Soils, Watersheds(Basins), Construction, Cities, Runoff.

Predicting sediment loss from urban construction sites is an important aspect in the planning and enforcement phases of a sediment control program. The Universal Soil Loss Equation (USLE) is an excellent means of relating soil management, cover, and other erosion control practices to erosion in agricultural areas. The USLE, however, cannot individually be used to estimate sediment yield. This paper described a procedure to predict sediment yield from urban construction areas. A sediment basin design procedure based on trap efficiency has been in use for several years in Maryland. The USLE concept for relating degree of erosion control to sediment basin trap efficiency is as yet untried in the field, but it appears to be one of the best procedures available. The universal soil loss equation is complex. Urban construction sites are not only complex but also changing daily. The complexities prevent accurate estimates of sediment yield from urban sites. (See also W76-09729) (Sims - ISWS)
W76-09746

LEGAL APPROACHES TO CONTROL RUNOFF AND SEDIMENTATION: A CASE STUDY OF GEORGIA,
The Research Group, Inc., Atlanta, Ga.
W. Q. Hudson, and G. T. Horton.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 205-209, October 1974.

Descriptors: *Erosion control, *Sediment control, *Legal aspects, *Georgia, Legislation, Erosion, Sedimentation, Construction, Farm, Farm management, Soil erosion, Sediments, Runoff, Urban runoff, Local governments, State governments, Land use, Sedimentology.

The State of Georgia's attempts to deal with its sedimentation problems, both urban and agricultural, offer a set of examples on approaches to problem solving. The purpose of this paper was to present the types of legal programs proposed and adopted in the state. The successes and failures were recognized. Sedimentation as a result of private and public actions in urban and rural areas is a problem which requires cooperative action from three governmental levels - state, regional, and local. Georgia's present situation was presented from these perspectives. The General Assembly during 1973-74 considered two major bills which offered a legal arrangement of duties and responsibilities. In addition, the enabling law for zoning and subdivision regulations which was adopted forty years ago was discussed. Regionally, two area-wide planning agencies have successfully adopted innovative approaches which rely on technical assistance to local government decision-making. Also, these two regional bodies are separately concerned with the urban and rural aspects of sedimentation control. Locally, through the continued assistance of local conservation districts, several cities and counties in Georgia have adopted sedimentation control ordinances and programs. (See also W76-09729) (Sims - ISWS)
W76-09747

WATERSHED MANAGEMENT AND SEDIMENT CONTROL IN MONTGOMERY COUNTY,
Environmental Protection Agency, Montgomery County, Md. Storm Water Management Section.
W. J. Davis.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 211-217, October 1974. 1 fig, 1 tab, 11 ref.

Descriptors: *Watershed management, *Sediment control, *Urbanization, *Maryland, Watersheds(Basins), Runoff, Urban runoff, Sediments, Sedimentation, Erosion, Channel erosion, Retention, Detention reservoirs, Structures, Streamflow, Streams, Rivers, Storm water, Water quality, Population, Local governments, Legal aspects.
Identifiers: *Montgomery County(Md).

Montgomery County, Maryland, immediately north of Washington, D.C., has undergone since 1950 a three-fold increase in population, accompanied by a phenomenal intensity of urban development outward from Washington, the

upshoot of heterogeneous, overlapping political jurisdictions, and a multitude and variety of physical problems, not the least of which are those related to the accelerated forces and pollution of storm water and their impacts upon the County's watersheds and the public and private interests therein. The County has embarked upon a comprehensive program for control for all of the problems involving storm water and sediment and other aspects of water quality where possible. This paper addressed the economic, social, political and legislative problems associated with the development and implementation of this program. The primary thrust is toward a watershed management system designed to prevent damages due to increased runoff from urban development. A pilot study is in progress for a typical urbanizing watershed in need of such a system. In addition, corrective measures are currently being developed in already urbanized watershed experiencing severe channel erosion and flooding. (See also W76-09729) (Sims - ISWS)
W76-09748

THE CONTRIBUTION OF A WATER INFORMATION SYSTEM FOR ENVIRONMENTAL PLANNING IN MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Geography.
For primary bibliographic entry see Field 6G.
W76-09753

THE ERODIBILITY OF PUMICE SOILS OF THE NORTH ISLAND, NEW ZEALAND,
Waikato Univ., Hamilton (New Zealand). Dept. of Earth Sciences.
M. J. Selby, and P. J. Hosking.
J Hydrol (Dunedin). 12(1), p 32-56, 1973.

Descriptors: *Soil erosion, Land development, Grasses, Pastures, *Gully erosion, *Erosion control, Vegetation establishment.
Identifiers: *New Zealand(North Island), *Pumice soils, Scrub.

Land development in the last 20 yr on the pumice soils of the central North Island has been followed by gully erosion. The erodibility of the soils under 3 classes of vegetation-pasture grasses, ungrazed grass, and scrub-has been assessed with the use of a specially designed flume which simulates gully erosion. Erosion is significantly higher beneath scrub than beneath grass vegetation when the same erosive stress is applied in each case. Under natural conditions, however, greater runoff, and therefore greater erosive power, always occurs on pasture grasses than under scrub. In spite of the greater inherent erodibility of scrub, actual erosion is therefore greater on pasture lands. Under pasture grasses, plant roots and organic matter bind the soil particles and inhibit erosion. This effect is less under scrub. Gully erosion is attributable to the low density and easy entrainment of pumice particles. The best prediction equation accounts for 83% of erosion in terms of only 2 variables.--Copyright 1974, Biological Abstracts, Inc.
W76-09787

METHOD OF EVALUATING THE EFFECTIVENESS OF TECHNIQUES FOR INCREASING THE RESISTANCE OF SOILS TO EROSION, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
V. Y. Grigor'ev, and M. S. Kuznetsov.
Biol Nauki. 17(12), p 130-133, 1974.

Descriptors: *Soil erosion, Methodology, Evaluation, Soil treatment, Wetting, Polymers, Soil horizons, Soil structure, Soil stability.
Identifiers: Hydrolyzed polyacrylonitrile, Polymer K-4.

The effect of preliminary wetting and treatment of soils with polymer K-4 (hydrolyzed polyacrylonitrile) for creating a water-stable structure on the resistance of loose tilled horizons to erosion was studied. An index for evaluating the effectiveness of these techniques is proposed.--Copyright 1975, Biological Abstracts, Inc.
W76-09805

RELATIONSHIP OF HEAVY RAINFALL TO SOIL EROSION IN VIEW OF ITS FORECASTING, (IN BULGARIAN),
Afforestn. Erosion Control Experimental Station, Sandanski (Bulgaria).
For primary bibliographic entry see Field 2J.
W76-09807

HYDROLOGY AND SEDIMENTATION OF BIXLER RUN BASIN, CENTRAL PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 2J.
W76-09830

URBAN-AREA SEDIMENT YIELD--EFFECTS OF CONSTRUCTION-SITE CONDITIONS AND SEDIMENT-CONTROL METHODS,
Geological Survey, Parkville, Md.
T. H. Yorke, and W. J. Herb.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-245 100/3GI (Proceedings), Printed copy $23.75, Microfiche $15.00. Reprint from Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976, held at Denver, Colorado, March 22-25, 1976: Water Resources Council, Sedimentation Committee, p 2-52 - 2-64, 1975. 13 p, 5 fig, 2 tab, 10 ref.

Descriptors: *Sediment yield, *Construction, *Urbanization, *Sediment control, *Maryland, River basins, Streamflow, Sediment transport, Data collections, Grading, Vegetation, Effects.
Identifiers: *Montgomery County(Md).

Suspended-sediment discharge and land use were monitored in eight small drainage basins in Montgomery County, Maryland, between 1963 and 1974. Five of these basins, located on the fringe of the rapidly expanding Washington, D. C., metropolitan area, were subjected to continuous construction activity as woodlots, pastures, and cultivated fields were replaced by houses, apartments, and shopping centers. Construction-site sediment yields ranged from 16 to 226 tonnes per hectare per year (7 to 101 tons per acre per year). The degree of sediment control and the slope conditions on construction sites were the most significant factors affecting sediment yields; the proximity of construction to stream channels and the length of time that surface soils were unprotected affected yields to a lesser extent. As a result of improvements in grading practices and control measures, construction-site sediment yields were reduced 60 to 80 percent between 1966 and 1974. (Woodard-USGS)
W76-09841

ESTIMATING SELECTED PARAMETERS FOR THE KENTUCKY WATERSHED MODEL FROM WATERSHED CHARACTERISTICS,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 2A.
W76-09852

PARAMETER OPTIMIZATION FOR WATERSHED MODELS,
New South Wales Univ., Kensington, Australia. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-09853

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

STUDIES OF PHYTOPLANKTON ECOLOGY IN THE BAY OF VALPARAISO: II. PHYTOPLANKTON 1970-1971, (IN SPANISH),
Chile Univ., Vina del Mar. Departamento de Oceanologia.
P. S. Avaria.
Rev Biol Mar. 15(2); p 131-148, 1975.

Descriptors: *Phytoplankton, Ecology, South America, Bays, *Biomass, *Life cycles, Seasonal, Annual, *Bioassay.
Identifiers: *Bay of Valparaiso(Chile), *Vertical distribution.

An analysis of the phytoplankton was made from the surface to 30 m depth between Nov.-Oct. 1971. Approximately weekly samples were taken in the same station, 2 miles off shore in front of Renaca beach in the bay of Valparaiso (Chile) for a total of 246 samples. General aspects of the annual cycle, biomass evaluation, specific composition and vertical distribution are discussed. (See also W73-03870)--Copyright 1976, Biological Abstracts, Inc.
W76-09408

ISOLATION OF SALMONELLA FROM SEWAGE AND SURFACE WATERS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of General Hygiene.
S. N. Cherkinskii, K. M. Klimenkova, G. P. Yakovleva, and M. S. Balakovskii.
Gig Sanit. 2, p 17-20, 1975.

Descriptors: *Isolation, *Salmonella, Sewage, *Pollutant identification, Water analysis, Chlorination, Waste water treatment, Human diseases.
Identifiers: Salmonella-Anatum, Salmonella-Heidelberg, Salmonella-London, Salmonella-Paratyphi, Salmonella-Stanleyville.

Salmonella spp. may play a role in the spread of infectious diseases by water routes. Urban sewage and surface water analyses showed a high incidence of salmonella recovery. S. anatum, S. london, S. paratyphi, S. heidelberg, and S. stanleyville were most frequently isolated. The number of recoveries was highest in spring. Chlorination of the sewage resulted in a high degree of decontamination from Salmonella. The enrichment capacity of a number of nutrient media for isolation of Salmonella from water was assessed.--Copyright 1975, Biological Abstacts, Inc.
W76-09411

EXPLORATION ROCK GEOCHEMISTRY-DETECTION OF TRACE ELEMENT HALO AT HEATH STEELE MINES (N. B., CANADA) BY DISCRIMINANT ANALYSIS,
New Brunswick Univ., Fredericton, Dept. of Geology.
For primary bibliographic entry see Field 2K.
W76-09473

COMBINED EFFECTS OF RADIOACTIVE, CHEMICAL AND THERMAL RELEASES TO THE ENVIRONMENT,
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5C.
W76-09490

POSSIBLE FUTURE EFFECTS ON THE POPULATION OF THE FEDERAL REPUBLIC OF

GERMANY OF GASEOUS RADIOACTIVE EFFLUENTS FROM NUCLEAR FACILITIES,
Kernforschungsanlage Julich, Aachen, Federal Republic of Germany.
G. Schwarz, H. Bonka, K. Brussermann, and D. Brenk.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. LAEA-SM-197/1. p 193-207, 2 tab, 6 fig, 5 ref.

Descriptors: *Environmental effects, *Radioecology, Fuels, Radiation, Nuclear energy Effluents, Forecasting, *Air pollution effects, Path of pollutants.

The potential radioecological effects arising from an increasing exploitation of nuclear energy over a period of 100 years are assessed. Results indicate that the complete emission of all radionuclides generated during normal operation, especially of fuel reprocessing plants, will be unacceptable and that it will be necessary to retain the tritium and Kr 85 generated in fuel reprocessing plants at a level of about 90-99%. The results are sufficient to indicate the long term trend the radiological burden and they afford a possibility of stating limits of radiation exposure and the sources that require strictest control. (See also W76-09490) (Chilton-ORNL)
W76-09499

SYNERGISTIC EFFECTS OF ATMOSPHERIC RELEASES OF RADIOACTIVE GASES AND SO2 IN INDUCING NUCLEATION IN THE ATMOSPHERE,
Bhabha Atomic Research Centre, Bombay (India).
K. G. Vohra.
In: Combined Effects of Radi, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. LAEA-SM-197/3. p 209-221, 1 tab, 5 fig, 24 ref.

Descriptors: *Environmental effects, *Nucleation, Sulfur compounds, Atmosphere, Ionization, Radiation, Photoactivation, *Air pollution effects.
Identifiers: Synergism.

The ionizing radiation dose in stack plumes can give rise to rapid conversion of ambient SO2 to nuclei by photochemical and ion-induced reactions. These nuclei can increase the global aerosol background which has an important role in cloud formation processes and in maintaining atmospheric radiation balance. Experiments showed that the combined effect of SO2 and ionizing radiation can give a larger production of condensation nuclei than normal photo-oxidation of SO2 in sunlight. Diurnal variations are attributed to the solar effect in the formation oxidant. Samples of filtered free air containing normal concentrations of SO2 and natural radon give rise to spontaneous formation of particles. Peaks of nucleus concentration occur only when there is an increase in SO2 concentration or radon content or both. Estimates of beta dose rate in the air for normal releases of Ar41, short-lived noble gases and tritium from reactor stacks, and SO2 releases from fossil-fueled plants are presented. (See also W76-09490) (Chilton-ORNL)
W76-09500

ADVANTAGES OF NUMERICAL ATMOSPHERIC DISPERSION CALCULATIONS FOR ESTIMATING DISPERSAL AND COMBINATION EFFECTS OF STACK RELEASES FROM THE NUCLEAR INDUSTRY,
Technische Universitaet, Hanover (West Germany).
H. Schultz, E. Voelz, and C. D. Wuneke.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. LAEA-SM-197/20. p 223-232, 2 fig, 9 ref.

Descriptors: *Model studies, *Mathematical models, *Atmosphere, *Air pollution effects, Pollutants, Nuclear powerplants, Topography, Wind, Time, Dispersion.

Preliminary investigations of the generation and distribution of pollutants as a consequence of chemical and other reactions acting in combination with atmospheric transport processes showed that the Gaussian distribution model can not be used except under assumed conditions of atmospheric homogeneity. A better method for solving complex atmospheric pollution transport problems that may occur in the neighbourhood of large nuclear power stations appears to be the use of a combined Eulerian-Lagrangian numerical approach known as the particle-in-cell method. The method has been tested successfully by making comparisons with typical Gaussian calculations over long time intervals or large distances and it was also applied to several actual transport problems involving complex topographies with wind variations in time, and to the effects of chemical reactions and local rainfall. (See also W76-09490) (Chilton-ORNL)
W76-09501

DISCUSSION OF POSSIBLE EFFECTS DUE TO MIXING OF RADIOACTIVE AND THERMAL RELEASES TO THE ATMOSPHERE FROM NUCLEAR POWER PLANTS,
Kernforschungszentrum, Karlsruhe (West Germany).
W. G. Hubschmann, K. Nestor, and J. G. Wilhelm.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/28. p 233-242, 1 tab, 2 fig, 10 ref.

Descriptors: *Model studies, *Radioactivity effects, *Thermal pollution, Atmosphere, Nuclear powerplants, Iodine, Retention, *Path of pollutants, *Air pollution effects.

As the number of reactors, stacks and cooling towers at a site increases, not only are the total radioactive emissions from the site increased but mixing of radioactivity and moisture will occur more often. The paper discusses the questions of whether (1) wash-out or rain-out could cause an increased radioactive deposition or (2) the strong buoyancy of the wet plume could help to decrease the radiological impact on the environment. It was assumed that a 100 m high stack of a 1000 MW(e) nuclear power plant lines up with a wet cooling tower in the main wind direction. Mixing mechanism at various wind velocities was investigated. It was found that the radiological effect of noble fission gas was reduced but in the case of radioiodine the two effects partly compensate each other. This leads to the conclusion that future reactors for nuclear power plant sites should be equipped with an effective iodine retention system. (See also W76-09490) (Chilton-ORNL)
W76-09502

SYNERGISTIC EFFECTS OF AIRBORNE EMISSIONS FROM NUCLEAR POWER PLANTS,
Motor-Columbus Consulting Engineers Inc., Baden (Switzerland).
H. Fuchs, W. Hofmann, and H. M. von Euw.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/29. p 243-252, 7 fig, 8 ref.

Descriptors: *Air pollution effects, *Environmental effects, Cooling towers, Nuclear powerplants, Sulfur compounds, Design.
Identifiers: *Synergism.

Emissions from power plants are released into an atmosphere which may be characterized by parameters such as weather conditions, and content of foreign particles. Since, along with source height and topography, these parameters exhibit wide variations, differing interaction processes between emissions and atmosphere are to be expected. The paper discusses the dispersion of emissions from the stack as they may be influenced by turbulence down-wind of high buildings or cooling towers. Parameters influencing the interaction between the stack plume and cooling tower plume are geometry or design of the towers and meteorology. Interaction between the two plumes can be reduced by adjustment of either the towers siting or design. The behaviour of sulfur dioxide and iodine is reviewed and it is concluded that the presence of strong sources of sulfur dioxide can lead to serious problems, since detrimental effects can be quite noticeable, and detailed investigations should be initiated at an early stage of plant design. (See also W76-09490) (Chilton-ORNL)
W76-09503

EXPERIENCE WITH A PILOT PLANT FOR THE IRRADIATION OF SEWAGE SLUDGE, ANALYTICAL STUDIES ON SEWAGE SLUDGE AND PLANT MATERIAL,
Technische Universitaet, Munich (West Germany). Institut fuer Radiochemie. Bayerische Landesanstalt fuer Bodenkultur, Pflanzenschutz, Munich (West Germany).
For primary bibliographic entry see Field 5D.
W76-09552

MONITORING WELLS,
Oregon State Engineer's Office, Salem.
For primary bibliographic entry see Field 4B.
W76-09558

WATER CHEMISTRY OF THE ST. LAWRENCE ESTUARY,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
V. Subramanian, and B. D'Anglejan.
Journal of Hydrology, Vol. 29, No. 3/4, p 341-354, April 1976. 6 fig, 4 tab, 30 ref.

Descriptors: *Water chemistry, *St. Lawrence Seaway, *St. Lawrence River, *Chemical analysis, *Estuaries, *Water quality, Saline water, Water properties, Analytical techniques, Salinity, Geochemistry, Hydrogen ion concentration, Trace elements, Water analysis, Tides, Destratification, Erosion rates, Dissolved solids, Heavy metals, Suspended solids, Silica.
Identifiers: *Mineral analysis, Continental runoff.

Based on a total dissolved load of 160 ppm, an erosion rate of 7,056 x 10 to the 10th power kg/year has been calculated for the St. Lawrence basin. The St. Lawrence river contributes 0.24% of the continental runoff to the world oceans. The water chemistry of the estuary suggests the presence of two water masses. While the dissolved silicates and Mn behave conservatively with respect to salinity, Fe shows a strong non-conservative behavior possibly due to the presence of a turbidity front and other dynamic processes in the estuary. Trace metals such as Co, Ni and Zn are enriched nearly ten times in the fresh water as compared to the estuarine waters. The water composition plotted in the alumino-silicate system indicates that kaolinite, illite, Mg-chlorite and microcline can be expected to be present in the sediments. Mineralogical observations on the suspended matter and sediments agree with this prediction. (Henley - ISWS)
W76-09581

DETERMINATION OF TETRAMETHYLTHIURAM DISULFIDE (TMTD) IN WATER AND AIR BY COLIMETRY, (IN RUSSIAN),
Pervomaisk Chemical Plant (USSR).
G. V. Semukhina.
Gig Sanit. 2, p 74-75, 1975.

Descriptors: *Pollutant identification, *Organic compounds, Water analysis, *Sulfides, *Colorimetry, Industrial wastes.
Identifiers: *Tetramethylthiuram disulfide.

To determine tetramethylthiuram disulfide (TMTD) in water it is extracted from water with chloroform, and a 1% alcoholic solution of copper chloride and alcohol are added to the chloroform solution of TMTD obtained in a quantity such that the chloroform/alcohol ratio is 2:3. After the solution obtained is held for 45 min on a water bath at 45-50C, it is analyzed by the colorimetric method. The sensitivity of the method is 0.2 mg/1. For determining the content of TMTD in the air of industrial rooms the dust of the preparation is caught by a filter and dissolved in chloroform. The further determination is conducted as described above. The sensitivity is 0.1 mg/m3.--Copyright 1975, Biological Abstracts, Inc.
W76-09590

MYXOBACTERIA OF THE MYXOCOCCUS GROUP AS INDIRECT INDICATORS OF FECAL MATTER IN SURFACE WATER: 1. COMMUNICATION, (IN GERMAN),
W. Graef.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 160(1), p 28-39, 1975.

Descriptors: *Bioindicators, Bacteria, Surface waters, Myxobacteria, Aerobic bacteria, Europe, Lakes, *Pollutant identification.
Identifiers: Austria, Fecal matter, Germany, *Myxococcus, Regnitz River, Switzerland, *Lake Constance(Germany), *Membrane-filter method.

The fruiting-body-forming myxobacteria of the Myxococcus group are coprophilic, i.e., they accumulate in biotopes containing fecal substances. A detection method of Myxococcus in water, based on the membrane-filter method, was developed. Field studies in the region of a mechanico-biological clarifying plant, above a stretch of the Regnitz River laden with waste-water, and on the Bodensee (Lake Constance) (West Germany) revealed a clear correlation between the load of fecal substances in such waters and their content of myxococci. These germs can be used as indirect bacterial indicators of fecal substances.--Copyright 1975, Biological Abstracts, Inc.
W76-09591

PHYTOPLANKTON OF THE SALINE WATERS OF KANEM (CHAD): X. CONCLUSIONS, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Dept. of Hydrobiology.
For primary bibliographic entry see Field 2H.
W76-09596

CHEMISTRY OF DISSOLVED INORGANIC CARBON IN ESTUARINE AND COASTAL BRACKISH WATERS,
Groningen Rijksuniversiteit (Netherlands). Environmental Isotopes Lab.
For primary bibliographic entry see Field 2L.
W76-09597

UNDERWATER OBSERVATIONS OF GELATINOUS ZOOPLANKTON: SAMPLING PROBLEMS, FEEDING BIOLOGY, LAND BEHAVIOR,
California Univ., Davis. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-09598

ISOLATION OF WATER VIBRIOS IN GREECE, (IN FRENCH),
Athens Univ. (Greece). Chaire Hygiene Epidemiology.
J. A. Papadakis, D. Trichopoulos, G. Papoutsakis, V. Kalapothaki, and P. Vassiliadis.
Ann Microbiol (Paris). 126A(3), p 361-366, 1975.

Descriptors: Isolation, *Pollutant identification, Europe, Water wells, Rivers, Water analysis, Sea water, *Bacteria.
Identifiers: Athens, Attica, *Greece(Athens), Attica, *Vibrio.

Water vibrios (Vibrio) were isolated from 3 superficial wells in the province of Attica, from 3 rivers situated at about 300,180 and 100 km NW of Athens, and from 4 samples of sea water from the seashore S of Athens (Greece).--Copyright 1975, Biological Abstracts, Inc.
W76-09601

DETERMINATION OF MICROQUANTITIES OF NAPHTHALENE IN ENVIRONMENTAL OBJECTS, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
L. R. Polishchuk.
Gig Sanit. 2, p 76-78, 1975.

Descriptors: *Pollutant identification, *Foods, *Spectrophotometry, Sewage, Calibration, Water analysis.
Identifiers: *Naphthalene.

A method of extracting naphthalene from food products and sewage, purification of the naphthalene-containing solutions on alumina and spectrophotometric determination are described. The content of naphthalene in the sample is calculated from calibration curves. The sensitivity is 0.1-0.2 micro-g/kg for food products and 0.2 mg/l for sewage.--Copyright 1975, Biological Abstracts, Inc.
W76-09620

THE ROLE OF BIOASSAYS IN ENVIRONMENTAL RESEARCH,
National Water Quality Lab., Duluth, Minn.
D. I. Mount.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A011 853, $3.50 in paper copy, $2.25 in microfiche. Report AMRL-TR-74-125, Paper No. 3, December, 1974. 8 p.

Descriptors: *Toxicity, *Bioassays, *Water Quality Act, *Analytical techniques, Laboratory animals, *Water analysis, Fish, Wildlife, *Laboratory tests, *Pollutant identification, Water pollution.
Identifiers: Applications of Bioassays, 1972 Water Quality Act.

A summary is presented of the use of bioassays with aquatic organisms to estimate the environmental impact of wastes discharged into water supplies. Toxicity bioassays are a useful analytical tool if applied skillfully and correctly. (Katz)
W76-09644

A SCREENING BIOASSAY USING DAPHNIA PULEX FOR REFINERY WASTES DISCHARGED INTO FRESHWATER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
A. L. Buikema, Jr., D. R. Lee, and J. Cairns, Jr.
Journal of Testing and Evaluation, Vol. 4, No. 2, p 119-125, 1976. 6 tab, 24 ref.

Descriptors: *Bioassay, *Methodology, *Analytical techniques, Fresh water fish, *Toxicity, Invertebrates, Oil, Phenols, Ammonia, Chromium, Snails, *Daphnia, *Pollutant identification, Bioindicators, *Oil wastes, Oil pollution, Water pollution effects.
Identifiers: *Daphnia pulex, Daphnia magna, Oil refinery wastes.

A simple method is suggested for on-site toxicity testing of refinery effluents. An arbitrary reference mixture, containing six common constituents of refinery wastewaters, was used for static toxicity tests on 15 species of freshwater invertebrates and 3 species of fish. Daphnia pulex was selected for further testing because it was the most sensitive of the animals tested, relatively inexpensive and easy to maintain, and a potential fish-food organism. The Daphnia bioassay would be sufficiently sensitive to give reliable results within 48 h, whereas a fish bioassay would show no toxicity even after 96 h. To assess the suitability of the Daphnia bioassay, tests were conducted by personnel at six petroleum refineries. Results of tests using actual refinery effluents ranged from no toxicity after 96 h to a mean lethal concentration of 1.2% effluent after 48 h. (Katz)
W76-09653

THE MICROBIOLOGICAL POLLUTION OF NORTH SEA AND ENGLISH CHANNEL SHORE, (IN FRENCH),
Institut Pasteur, Lille (France). Laboratoire d'Hydrobiologie.
For primary bibliographic entry see Field 5C.
W76-09657

EFFLUENT DETENTION PONDS DECHLORINATE WASTEWATER,
Stone (Ralph) and Co., Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 5D.
W76-09678

MODERN TECHNIQUES OF WASTE DETECTION,
East Worcestershire Waterworks Co., Bromsgrove (England).
For primary bibliographic entry see Field 5F.
W76-09685

APPLICATION OF REAL-TIME MASS SPECTROMETRIC TECHNIQUES TO ENVIRONMENTAL ORGANIC GEOCHEMISTRY. I. COMPUTERIZED HIGH RESOLUTION MASS SPECTROMETRY AND GAS CHROMATOGRAPHY-LOW RESOLUTION MASS SPECTROMETRY,
California Univ., Berkeley. Space Sciences Lab.
B. R. Simoneit, D. H. Smith, and G. Eglinton.
Archives of Environmental Contamination and Toxicology, Vol. 3, No. 4, p 385-409, 1976. 5 fig, 1 tab, 41 ref.

Descriptors: *Organic compounds, *Pollutant identification, *Spectrometry, Computers, Sewage treatment, *Gas chromatography, Carbon, Hydrogen, Chlorine, Data collections, *Analytical techniques, *Mass spectroscopy, Methodology.

A mass spectrometer/computer system (LOGOS) was used to study organic compounds in the environment. A water-borne particulate sample, an air particulate sample from Bristol, England; filtered water samples from San Francisco Bay; and a sewage sludge sample were examined. The mass spectrum for the water-borne particulate sample consisted predominantly of hydrocarbon ions of relatively high degrees of unsaturation. The air particulate sample contained a more diverse and complex mixture. Species containing between one and four oxygen atoms made important contributions to the mixture. Solvent soluble extracts of water from the San Francisco Bay consisted predominantly of a variety of complex hydrocarbon mixtures. The relative amounts of the various hydrocarbon structural types varied widely. The major compound investigated in sewage sludge was bis(p-chlorophenyl)acetonitrile(p,p'-DDCN). The LOGOS system normally calculates composition according to numbers of carbon, hydrogen, and chlorine atoms within a specified range; but, to investigate a specific compound, another atom,

in this case nitrogen, can be added and the maximum empirical formula specified only slightly larger than the empirical formula of the compound of interest. The mass spectrometer/computer system was very satisfactory for preliminary data characterization. (Snyder-FIRL)
W76-09687

DISSOLVED OXYGEN ANALYZER T-01 ANALYZER. A SIMPLE APPARATUS FOR ELECTROCHEMICAL DETERMINATION OF DISSOLVED OXYGEN IN WATER (TLENOMIERZ T-01 UPROSZCZONY PRZYRZAD ELEKTROCHEMICZNEGO OZNACZANIA TLEUNU ROXPUSZCZOMEGO W ROZTWORACH WODNYCH),
J. Czerniec, Z. Gregorowicz, J. Fligier, J. Zielinski, and W. Lexzozynski.
Inzynieria Sanitarna, Vol. 19, No. 443, p 133-141, 1976.

Descriptors: *Analytical techniques, *Dissolved oxygen, *Instrumentation, *Water analysis, *Pollutant identification, Electrochemistry.

An analyzer has been developed for the electrochemical determination of dissolved oxygen in water. This dissolved oxygen analyzer, model T-01, is a galvanic cell consisting of a silver-lead couple separated from the test sample by a polyethylene membrane. Simple measurements may be made based on the output current without amplification or temperature compensation. (Kramer-FIRL)
W76-09688

ORGANIC CONTAMINANTS OF WATER,
Dow Chemical U. S. A., Midland, Mich. Waste Control Div.
C. E. Hamilton.
ASTM Standardization News, Vol. 4, No. 1, p 34-35, 49, January, 1976.

Descriptors: *Analytical techniques, *Pollutant identification, *Organic compounds, Biochemical oxygen demand, Chemical oxygen demand, Activated carbon, Gas chromatography, Water analysis.

Organic matter of either human or natural origin causes problems in drinking water and industrial water. Little is generally known about the specific organic compounds in a water waste stream; many possible products of reactions among the contaminants may never have been isolated or identified. Little effort is made to define the constitutents precisely except when adverse effects on humans or the environment are suspected. Sensory perception, by sight or smell, of organic pollution, although subjective, is widely available, inexpensive, and very sensitive to certain types of contamination. Smell has not been widely used due to the variation in individual response to the same stimuli. Photometers and colorimeters can be used to improve upon visual observation. Invisible portions of the spectrum can also be used. Biochemical oxygen demand (BOD) measures the oxygen required to stabilize biodegradable material, but can only be compared among similarly tested samples. Chemical oxygen demand (COD) does not measure organics specifically, because some inorganics also reduce the chemical oxidant. The organic concentration can be determined from the results of a form of total carbon analysis. The total oxygen demand measures the ultimate oxygen required to stabilize the contaminants, but may not accurately indicate organic content because some inorganics consume oxygen and some substances release oxygen. Solvent extraction and activated carbon absorption determine total organic contaminants, but variable extraction efficiencies, loss of volatile organics, and water and organic salts accumulation must be considered. Use of gas chromatography to analyze organic water contaminants has begun and will probably increase. (Snyder-FIRL)
W76-09689

EVALUATION OF COMBINED APPLICATIONS OF ULTRAFILTRATION AND COMPLEXATION CAPACITY TECHNIQUES TO NATURAL WATERS,
Skidaway Inst. of Oceanography, Savannah, Ga.
R. G. Smith, Jr.
Analytical Chemistry, Vol. 48, No. 1, p 74-76, January, 1976. 1 fig, 2 tab, 11 ref.

Descriptors: *Membrane processes, *Organic compounds, Rivers, *Pollutant identification, Carbon, Analytical techniques, Distribution, Dissolved solids, *Georgia, Estuaries, Path of pollutants, Copper, Salinity, Volumetric analysis, Filtration.
Identifiers: *Ultrafiltration, *Anodic stripping voltametry, Complexing materials, Organic carbon.

The application of a combination of ultrafiltration, membrane fractionation, and anodic stripping voltammetry to studying the distribution of complexing materials in natural waters was evaluated. Each sample was separated into several fractions, and the complexation capacity of each fraction for copper was determined. Between 80 and 90% of the total dissolved organic carbon was recovered after fractionation with a plus or minus 4% coefficient of variation. Precision of plus or minus 8% was obtained. The technique was applied to samples from five stations in a Georgia estuary. The apparent ability of low molecular weight fractions to complex copper increased with increasing salinity. This method should be useful in studying the mechanisms of trace metal interaction with organics in river systems. (Snyder-FIRL)
W76-09690

PROBLEMS CONCERNING THE CHARACTER OF OXIDIZABILITY OF CERTAIN ORGANIC SUBSTANCES IN WATER TREATED WITH OZONE (PROBLEMES LIES A L'EVOLUTION DU CARACTERE D'OXYDABILITE DE CERTAIN CORPS ORGANIQUES PRESENTS DANS L'EAU TRATEE PAR L'OZONE),
For primary bibliographic entry see Field 5D.
W76-09692

BIODEGRADABILITY AND PROCESS FOR BIOLOGICAL PURIFICATION OF WASTE WATER (LA BIODEGRADABILITE ET LES PROCEDES D'EPURATION BIOLOGIQUE DES EFFLUENTS),
For primary bibliographic entry see Field 5D.
W76-09693

TURBIDIMETER LIGHTS THE WAY TO ACCURATE PROCESS CONTROL,
Process Engineering, p 87-88, February, 1976. 4 fig.

Descriptors: *Analytical techniques, *Turbidity, *Photometry, *Pollutant identification, Equipment, Control, Performance, Operations.
Identifiers: *Process control, *Turbidimeters, Photocells.

In the late 1960's only a few process photometers were available, most of which depended on effects such as extinction/absorption or scattering. Disadvantages of these meters included the need for large dilutions; the need for frequent cleaning, calibration, and maintenance; and sensitivity to color changes. A four beam alternating light photometer was subsequently developed, with a probe which can be submerged in the material being measured. It was designed to be sufficiently accurate for process control. The probe has two lamps, which can be lit alternately, and two photocells, with the fluid to be measured between the lamps and photocells. The extinction module of the fluid is determined from the current from the two photocells using one lamp at a time. Because the equations used eliminate the photocell currents and photo-electric constants, the measurements are independent of lamp intensity or dirt on the lamps or photocells. (Snyder-FIRL)
W76-09694

STEROIDS IN EFFLUENTS,
Clyde River Purification Board, Glasgow(Scotland).
J. P. Dawson, and G. A. Best.
Proceedings of the Analytical Division, Chemical Society, p 311-315, December, 1975. 1 fig, 4 tab, 4 ref.

Descriptors: *Tracers, *Coliforms, *Pollutant identification, Sewage treatment, Water pollution, Bacteria, Effluents, Waste water treatment, Bioindicators, Path of pollutants.
Identifiers: *Fecal contamination, *Coprostanol, *Steroids.

The use of coprostanol, a steroid, was investigated as an internal tracer for fecal contamination in water. The method was first tested on spiked samples; steroid concentrations were then determined at various stages of treatment in sewage works, upstream and downstream from an effluent discharge, near a large sewage works discharging settled sludge into an estuary, near a small outfall discharging macerated sewage, and at various remote areas on the West coast of Scotland. The reduction of coprostanol due to sewage treatment was similar to that of conventional water pollution parameters. The coprostanol concentration gradually decreased with distance downstream from the effluent discharge, but the cholesterol concetration showed no such trend, probably because cholesterol from farm drainage had entered the stream above the discharge. Tests in the estuary also showed the advantate of coprostanol over cholesterol as a tracer. Coliform counts were more variable than steroid analysis; steroids were rapidly diluted in the estuary, and steroids and coliforms were found in surface water over 20 km from the discharge. It was difficult to compare results from coprostanol, cholesterol, and coliform measurements near the small outfall, due to the variability of results. Results from both fresh and saline water indicated coprostanol to be a good indicator of fecal pollution. Coprostanol analysis requires more time than bacteria counting, but analysis does not need to be done immediately, and the results obtained are less subject to error. (Snyder-FIRL)
W76-09696

TRACE-ELEMENT ANALYSIS USING X-RAY EMISSION SPECTROSCOPY,
Institut., Rudjer Boskovic, Zagreb (Yugoslavia).
D. Rendic, S. Blagus, V. Pecar, and V. Valkovic.
Fizika, Vol. 7, p 112-115, 1975. 2 fig, 3 ref.

Descriptors: *X-ray spectroscopy, *Analytical techniques, *Pollutant identification, *Trace elements, Water pollution, Environmental effects, Metals, *X-ray analysis, Computer programs, *Spectroscopy.

The basic process in X-ray spectroscopy consists of exciting a sample with incoming photons or charged particles and detecting the X-rays emitted. It is used to analyze trace elements. Its many fields of application include the study of water pollution. Its advantages include simultaneous determination of all medium-heavy and heavy metals, simple sample preparation and the ability to use small sample quantities, high accuracy, and the ability to detect concentrations as small as one in 1,000,000. An X-ray spectroscopy system has been developed which includes a computer program for automatic analysis of X-ray spectra and determining absolute elemental concentrations. This system is widely used in studying environmental samples. A similar system is being built at the Rudjer Boskovic Institute based on experience with the first system. The development of similar computer programs for analyzing X-ray spectra is included. According to preliminary results, the

method has numerous capabilities and advantages for analyzing elements in low concentrations. Using an X-ray source of around 1000 watts would establish X-ray emission spectroscopy as a powerful new technique with applications in fundamental research as well as environmental pollution. (Snyder-FIRL)
W76-09697

DISTRIBUTION OF BDELLOVIBRIO BACTERIOVORUS IN SEWAGE WORKS, RIVER WATER, AND SEDIMENTS,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
J. C. Fry, and D. G. Staples.
Applied and Environmental Microbiology, Vol. 30, No. 4, p 469-474, April, 1976. 4 fig, 3 tab, 20 ref.

Descriptors: *Pollutant identification, *Bacteria, Rivers, *Sewage, Aerobic conditions, Anaerobic conditions, Sewage treatment, Effluents, Distribution, *Path of pollutants, Water pollution.
Identifiers: *Bdellovibrio bacteriovirus.

The source and extent of Bdellovibrio, a bacterial predator, in British rivers were studied, along with the possibility that it could grow or control bacterial populations in river sediments or sewage. Bacteria from samples of river water, liquid sewage, final settlement sludge, and river sediment were cultured, and plaques were counted and examined microscopically. Bdellovibrio occurred in all liquid sewage examined. It also occurred in all river sediments and polluted river waters examined, although it was not found in some of the unpolluted river waters. The predator could multiply on the large numbers of bacteria in aerobic percolating filter films, but not in anaerobic sludge. It occurred in river sediments' aerobic surface layers, but not in anaerobic bottom layers. Sewage works effluents were the major Bdellovibrio source in polluted rivers examined, and numbers in sediment and river water were correlated with the quality of the river water. Bdellovibrio was probably not important in controlling other bacteria either in sewage or in river sediment. (Snyder-FIRL)
W76-09698

LABORATORY EVALUATION OF THE COULTER ON-LINE PARTICLE MONITOR,
Welsh School of Pharmacy, Cardiff.
M. I. Barnett, E. Sims, and R. W. Lines.
Powder Technology, Vol. 14, No. 1, p 125-130, May-June, 1976. 2 fig, 3 tab, 7 ref.

Descriptors: *Measurement, *Laboratory tests, *Monitoring, Microorganisms, Flocculation, Oceans, Control, *Pollutant identification, Water pollution effects, Microbiology.
Identifiers: Coulter on-line particle monitor.

The Coulter On-Line Particle monitor, which counts particles within specified size intervals for control purposes or continuous monitoring, was evaluated in the laboratory. The monitoring applications studied include filtered electrolyte, intravenous fluids, sea and river water, and microbial growth. Instrumental noise and external interference caused a minor problem, giving a lower limit of about 3% of aperture diameter instead of the normal 2%. When used with the proper Coulter Counter, it has direct application to studying microbiological growth and flocculation. The monitor also has obvious applications to the study of particulate contamination. Sea water and river water were successfully monitored using 100 micron aperture tubes, although the low conductivity of the river water gave rise to some noise generation below 4 to 5% of the aperture diameter. (Snyder-FIRL)
W76-09699

HOW TO BUILD A BETTER BENCH SHEET,
Las Cruces Water Quality Lab., N. Mex.
For primary bibliographic entry see Field 5D.
W76-09701

REPRESENTATIVE DIRTY WATER SAMPLING,
R. Jenkins.
Effluent and Water Treatment Journal, Vol. 16, No. 3, p 144-145, March, 1976. 2 fig, 3 ref.

Descriptors: *Sampling, *Suspended solids, *Effluents, *Pollutant identification, Municipal wastes, Industrial wastes, *Monitoring.

Effluent sampling is required to determine the composition of liquids with suspended solids, but the sampling method itself may change the fall-out rate in its vicinity, leading to errors. Many samples are needed due to the varying composition of the fluid, and sampling rate should be proportional to flow, because many processes have periods of high flow rate and low contamination, and low flow rate and high contamination. The simplest continuous automatic sampler is the air displacement sampler, which is immersed in the fluid so that hydrostatic pressure pushes the sample into the sampling chamber. If the inlet is placed at 20% of 'full bore', the rate of sampling against flow rate approximates the characteristic of the pipe or channel. The average absolute error between 10 and 100% of full flow is under 1% for pipes and 2% for channels. The design of this type of sampler ensures that samples are 'representative' due to the design inlet and absence of a pump, and mathematically representative due to the rate of sampling being nearly proportional to flow rate. (Snyder-FIRL)
W76-09702

POLLUTION INFLUENCE ON THE INFUSORIAL FAUNA (PROTOZOA, CILIATA) OF BULGARIAN RIVERS II. THE OGOSTA RIVER AND ITS EFFLUENTS,
R. Detcheva.
Khidrobiologiia, No. 2, p 19-31, June, 1975. 1 fig, 3 tab, 4 ref.

Descriptors: *Pollutant identification, *Microorganisms, *Rivers, Water pollution effects, Biochemical oxygen demand, Ammonia, Dissolved oxygen, *Protozoa, Effluents.
Identifiers: *Bulgaria(Ogosta River).

Species of ciliates were investigated in 56 sampls from 14 locations along the Ogosta River, Bulgaria, and its tributaries from spring to autumn 1969. The seasonal influence and the influence of river pollution on the species of ciliates present was studied. Fifteen hydrochemical indices giving some indications as to the saprobiological conditions in the river, compared with previous values. The data exactly coincided for several species. Some deviations occurred in the values of dissolved oxygen, ammonia, and biochemical oxygen demand (BOD). (Snyder-FIRL)
W76-09714

AN UNDERWATER TEMPERATURE-DEPTH DATA COLLECTION DEVICE,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 2H.
W76-09727

CONCENTRATION OF HEAVY METALS IN SEDIMENTS OF A HYDROELECTRIC IMPOUNDMENT,
Montana Univ., Missoula, Dept. of Zoology.
A. K. Bailey, and G. F. Weisel.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-254 549, $4.50 in paper copy, $2.25 in microfiche. Research Report No. 75, Montana University Joint Water Resources Research Center, Bozeman, March 1976. 66 p, 10 fig, 7 tab, 32 ref. OWRT A-086-MONT(1).

Descriptors: Water quality, *Heavy metals, *Sediments, Settling basins, *Mine wastes, *Lake sediments, Iron, Zinc, Copper, Manganese, *Pollutant identification, Impoundments, Hydroelectric plants, *Montana, Invertebrates, Oligochaetes, Diptera.
Identifiers: Milltown Dam(Mont), Clark Fork River(Mont), Metal concentration, Blackfoot River(Mont).

Milltown Dam, located near Bonner, Montana, has acted as a settling basin for 69 years for wastes in the Clark Fork River originating from the Butte mines and Anaconda Copper Mining Company smelter 95 miles upstream. This study undertook the determination of the amounts of heavy metals accumulated in the sediments of Milltown reservoir. Sediments in the Blackfoot River portion of the reservoir were used for comparison with the Clark Fork River sediments. Sediment cores from the Clark Fork River had high levels of Cu, Zn, and Mn compared to sediments reported in other studies and to a core taken from the Blackfoot River. Peaks of high Cu, Zn, Mn, and Fe concentrations were found at the same depth within most of the Clark Fork cores. Cu concentration ranged in these cores from 50-7,900 microgram/gm; Zn ranged from 300-7,900 microgram/gm; Mn ranged from 350-2,900 microgram/gm; Fe ranged from 10,500-43,300 microgram/gm. The peaks of metal concentration were concluded to be caused by changes in operations, smelter shutdowns, and spills from settling ponds near Anaconda. Macroinvertebrates in sediment samples were predominately oligochaetes and one species of dipteran (Chironomus (Chironomus) sp.). There was no statistically significant difference between the numbers and kinds of macroinvertebrates at the mouth of the Blackfoot River and the Clark Fork impoundment.
W76-09755

MATERIALS BUDGETS OF LAKE CHAMPLAIN,
Vermont Univ., Burlington. Dept. of Zoology.
E. B. Henson, and M. Potash.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 562, $4.50 in paper copy, $2.25 in microfiche. Vermont Water Resources Research Center, Burlington, Completion Report, January 1976. 62 p, 6 fig, 17 tab, 16 ref. OWRT A-014-VT(2).

Descriptors: Dissolved solids, Phosphates, Conductivity, Eutrophication, Lakes, *Nutrients, Water quality, *Recycling, *Vermont, *Cycling nutrients, Tributaries, Estimating, *Pollutant identification, Cations, Alkalinity.
Identifiers: *Lake Champlain.

Objectives were to ascertain the general water quality status of the tributaries discharging into Lake Champlain and to estimate the materials input to the lake. Water samples were collected from about 40 tributaries during the period 1970-1974. The water samples were analyzed for the major cations (Ca++, Mg++, Na+, and K+), total and reactive phosphate, conductivity, alkalinity, and pH. In addition, analyses for dissolved oxygen, BOD, and suspended material were sometimes made. Total dissolved solids into Lake Champlain amounted to 888,429 tons annually (713 gms/sq. meter). Total phosphorous from the tributary streams ranged between 200 to more than 400,000 lbs/yr. It was estimated that more than 50% of the total phosphorous being added to the lake was retained in the lake, 21% of the sodium, 13% of the magnesium, and 3% of the dissolved solids. Ten years of data collected from the main lake reference stations were summarized.
W76-09756

SEDIMENT PROPERTIES, LAKE CHAMPLAIN: 1971-1975,
Vermont Univ., Burlington. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-09763

PLANKTON ANALYSIS TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio.
For primary bibliographic entry see Field 5C.
W76-09782

IS THE EXAMINATION OF DRINKABLE WATER AND SWIMMING POOLS ON PRESENCE OF ENTEROPATHOGENIC E. COLI NECESSARY, (IN GERMAN),
Mikrobiologie Institut Medical Fakulteti, Ljubljana (Yugoslavia).
For primary bibliographic entry see Field 5C.
W76-09785

RADIATION HAZARD OF IODINE-129, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W76-09788

MARINE SOIL POLLUTION AND SELF-PURIFICATION, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
L. N. Kiryukhina, M. I. Kucherenko, and O. G. Mironov.
Gidrobiol Zh. 10(2), p 55-59, 1974.

Descriptors: *Microorganisms, Marine animals, *Bottom sediments, *Bays, Bottom sampling, *Self-purification, Water analysis, *Pollutant identification.
Identifiers: *Carbohydrate oxidizing microorganisms.

A detailed analysis is given of the physicochemical composition of the bottom sediments, distribution of chemical components with depth and the species composition, density and regularity of occurrence of carbohydrate oxidating microorganisms. The data show weak self-purification processes in the bottom sediments of the bay.--Copyright 1975, Biological Abstracts, Inc.
W76-09789

SEDIMENTATION AND PHOSPHORUS BALANCE IN LAKE LUCERNE (HORW BAY) AND IN THE ROTSEE, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5C.
W76-09790

PRESENCE AND SOME PROPERTIES OF BACTERIA OF THE FAMILY PSEUDOMONADACEAE IN THE RIVER DANUBE, (IN GERMAN),
Slovenska Akademie Vied, Bratislava Czechoslovakia). Limnobiologisches Institut.
B. Trzilova.
Biologia (Bratisl) 29(9), p 681-690, 1974.

Descriptors: *Bacteria, *Pseudomonas, *Distribution, Rivers, Europe, Temperature, Aeration, *Enteric bacteria, *Chromatography, *Pollutant identification.
Identifiers: *Aeromonas, Aeromonas-Hydrophila, Aeromonas-Punctata, Aeromonas-Salmonicida, Chromatography, Czechoslovakia, Danube, Pseudomonas-Fragi, Pseudomonas-Putida, Pseudomonas-Stutzeri, *River Danube.

The numbers, species distribution and antagonistic activity of bacteria of the family Pseudomonadaceae from 1 profile in the middle of the river Danube (Czechoslovakia) from 1969-1970 are described. The bacteria showed great numbers during winter and spring, the lowest values seen from May until Sept. Isolated species were Pseudomonas fragi, P. putida, P. stutzeri, Aeromonas salmonicida, A. hydrophila and A. punctata. An indirect correlation with temperature was shown in bacteria of the genus Pseudomonas anda direct one in bacteria of the Aeromonas. From 102 isolated strains of the family Pseudomonadaceae some 69 inhibited the growth of bacteria of the family Enterobacteriacae. With water aeration of values to 1.01/min the elimination of Enterobacteriaceae is speeded up. By use of chromatography it was shown that strains of the genus Aeromonas and Pseudomonas produced efficient substances which are moderately hydrophilic in character and are spectrally related.--Copyright 1975, Biological Abstracts, Inc.
W76-09792

DETERMINATION OF FLUORINE IN DRINKING WATER WITH A CERIUM(III)- OR LANTHANUM ALIZARIN COMPLEX, (IN RUSSIAN),
Research Inst. of Public Water Supply Water Purification, Moscow (USSR).
L. A. Khristianova, N. I. Udal'tsova, and S. S. Soldatova.
Gig Sanit. 11, p 88-89, 1974.

Descriptors: *Pollutant identification, *Fluorine, Potable water, *Photometry, Methodology, Ions, Water analysis.
Identifiers: *Cerium, *Lanthanum-alizarin.

To determine the F ion in drinking water, the photometric method was tested, with the use of a Ce(III)- or La-alizarin complex. This method is highly sensitive and selective, and the time of analysis is 5-6 times shorter than with the use of the conventional method.--Copyright 1975, Biological Abstracts, Inc.
W76-09796

HYGIENIC STANDARDIZATION OF TIN DIBUTYL DIISOOCTYLTHIOGLYCOLATE IN WATER BODIES, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
For primary bibliographic entry see Field 5C.
W76-09797

SANITARY INSPECTION OF SURFACE WATERS POLLUTED WITH AROMATIC AMINO AND NITRO-COMPOUNDS, (IN RUSSIAN),
Leningrad State Medical Inst. of Sanitation and Hygiene.
A. G. Ilichkina, I. I. Bat', and V. V. Kirichenko.
Gig Sanit. 9, p 100-101, 1974.

Descriptors: *Organic compounds, Surface waters, *Aromatic compounds, *Nitrogen compounds, Methodology, *Pollutant identification, Phenols, Amino acids, Oxidation, Metabolism, Oxygen, Water pollution.
Identifiers: Allergens, *Amino compounds, Aniline, Benzene.

Methods are described for quantitative analysis of p-phenetidine, p-nitrophenol, m-trifluoromethylnitrobenzene, which cause degenerative changes in the blood and methemoglobinemia and are delayed-type allergens. When present in small quantities, these aromatic amino- and nitro-compounds can be oxidized biochemically and chemically, but when present in higher quantities, they can be only chemically oxidized; these compounds utilize O2 during metabolic breakdown.--Copyright 1975, Biological Abstracts, Inc.
W76-09798

IRON-MANGANESE MICROORGANISMS STUDIED BY OVERGROWING TECHNIQUE, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institute of Lakes Keeping.
R. S. Kutuzova.
Mikrobiologiya. 44(1), p 156-159, 1975.

Descriptors: *Microorganisms, Lakes, *Pollutant identification, Iron, Manganese, *Microscopy, Analytical techniques.
Identifiers: Euglena, Mettalogenium, Trachelomonas-Volvocina, *USSR(Lake Krasnoye), *Iron-manganese microorganisms, Capillary microscopy.

Microorganisms in the surface layer of ooze and in the bottom layer of water in the ore field of Lake Krasnoye were studied by capillary microscopy (USSR). The lake Fe-Mn organisms differ from those in the 2nd ooze profile. Fe-Mn microorganisms were found on Euglena, and the nature of the relationship is discussed. (Metallogenium and Trachelomonas volvocina are also discussed.)--Copyright 1975, Biological Abstracts, Inc.
W76-09813

THE HEAVY METAL CONCENTRATIONS IN THE WATERS ALONG THE COAST OF FUKUYAMA, (IN JAPANESE),
Kagoshima Univ. (Japan). Lab of Marine Botany and Environmental Sciences.
A. Inoue, R. Kaibara, and S. Asakawa.
Mem Fac Fish Kagoshima Univ. 23, p 217-228, 1974.

Descriptors: *Heavy metals, Coasts, *Spectrophotometry, *Pollutant identification, Seasonal, Rainfall, Iron, Manganese, Nickel, Zinc, Cobalt, Copper, Cadmium.
Identifiers: *Japan(Fukuyama), *Atomic absorption spectrophotometry.

The concentrations of heavy metals (Fe, Mn, Co, Cu, Zn, Ni and Cd) in the nearshore waters of Fukuyama (Japan), were determined at monthly intervals by atomic absorption spectrophotometry and their seasonal and geographic variations discussed. The heavy metal concentrations were 0.10-0.15 micro-g/ml, Fe; 0.001-0.030, Mn; 0.02-0.04, Co; 0.009-0.090, Zn; 0.004-0.030, Cu; 0.003-0.030, Ni; and 0.0005-0.003, Cd, respectively. The samples retain normal concentrations of trace elements for coastal waters with the exception of Ni. Seasonal changes of heavy metal concentrations were not detected except for Fe and Mn which increased during and after the rainy season in summer suggesting replenishment from land. No definite difference was found for any metals between the surface and bottom waters. A direct linear relationship was detected between Cu and Zn.--Copyright 1975, Biological Abstracts, Inc.
W76-09815

OSCILLOPOLAROGRAPHIC DETERMINATION OF CYANIDE IN WASTE ELECTROPLATING INDUSTRIAL EFFLUENTS,
Istituto di Chimica Generale e Inorganica Pavia (Italy). Laboratorio Chimica Analitica.
C. Bertoglio Riolo, T. Fulle Soldi, G. Spini, and M. Pesavento.
Ann Chim. 64(5/6); p 425-428, 1974.

Descriptors: Analytical techniques, *Polarographic analysis, Effluents, Wastes, Water pollution sources, *Industrial wastes, *Pollutant identification.
Identifiers: *Cyanide, *Electroplating industry, *Oscillopolarographic technique.

A rapid, easy and reliable oscillopolarographic technique for the determination of cyanide, free and/or complexed, in waste electroplating industrial effluents samples is described. The method provides sensitivity of 0.1 mg/l. The analysis is performed directly on the electroplating waste effluent samples, avoiding chemical pre-treatments and distillation processes. The method takes advantage of the formation of a Cu(I)-cyanide complex obtained by adding suitable quantities of cupric ions to the samples. This compound, in a basis medium, shows an oscillopolarographic peak. Its stability constant is higher than that of other cyanocomplexes of heavy cations (except

for Fe(II) and Co(III)). This fact allows the determination of cyanide, free or complexed with such cations.--Copyright 1976, Biological Abstracts, Inc.
W76-09822

BALANIDAE AS POLLUTION INDICATORS IN THE BAY OF GUANABARA, (IN PORTUGUESE),
Instituto Oswaldo Cruz, Rio de Janeiro (Brazil).
D. Lacombe, and W. Moneiro.
Rev Bras Biol. 34(4), p 633-644, 1974.

Descriptors: *Pollutant identification, *Bioindicators, Indicators, Analytical techniques, Bays, South America.
Identifiers: *Balanidae, Balanus-Amphitrite-Amphitrite, Balanus-Tintinnabulum, Brazil, Tetraclita-Squamosa-Stallactifera, *Barnacles, *Brazil(Bay of Guanabara).

Certain barnacle species are useful as pollution indicators. Among the different species occurring in the Bay of Guanabara (Brazil) Balanus amphitrite amphitrite is the best pollution indicator. This is the only dominant and widespread species in the bay. Three varieties of B. tintinnabulum were observed in the entrance of the bay and Tetraclita squamosa stallactifera in the Flamengo, Botafogo and surroundings. Only B. a. amphitrite is dominant in the bay; its resists all grades of pollution.--Copyright 1976, Biological Abstracts, Inc.
W76-09823

APPRAISAL OF WATER RESOURCES OF NORTHWESTERN EL PASO COUNTY, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2E.
W76-09828

HYDROLOGY AND SEDIMENTATION OF BIXLER RUN BASIN, CENTRAL PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 2J.
W76-09830

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE MAJOR COAL AND OIL SHALE AREAS OF WYOMING, 1975-76,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4A.
W76-09833

DETERMINATION, STORAGE, AND PRESERVATION OF LOW MOLECULAR WEIGHT HYDROCARBON GASES IN AQUEOUS SOLUTION,
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 2K.
W76-09834

GEOCHEMICAL AND ISOTOPIC ANALYSES OF WATERS ASSOCIATED WITH THE EDWARDS LIMESTONE AQUIFER, CENTRAL TEXAS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2K.
W76-09836

BIOLOGICAL INDICATORS OF ENVIRONMENTAL QUALITY. A BIBLIOGRAPHY OF ABSTRACTS,
W. A. Thomas, W. H. Wilcox, and G. Goldstein.
Illus. Ann Arbor Science Publishers Inc.: Ann Arbor, Mich., 1973, 254 p. $16.50.

Descriptors: *Bioindicators, *Bibliographies, *Abstracts, Air pollution, Algae, Anions, Bacteria, Birds, Conifers, Environment, Fish, Lichens, Metals, Pesticides, Pollutants, Tobacco.
Identifiers: Moss.

An extensive bibliography is provided on the subject of biological indicators. The selected abstracts emphasize the practical aspects of interpreting the biological manifestations of deteriorated environmental conditions and are organized so that users can focus their attention at any level of biological organization from the molecule to the community. The content begins with a section on cell-free systems, including air pollutants, anions, pesticides, trace metals and water pollutants. A section is then included on cultured cells, followed by a section on tissues and organs, including animal tissue, blood chemistry fish brain enzyme and plant tissue. The next section covers organisms, beginning with air pollutants, including general, halides, nitrogen oxides, oxidants and sulfur oxides. Next, animals are discussed, including aquatic invertebrates, birds, and fish, followed by a section on plants, covering conifers, lichens and moss and tobacco. A section is then included on unicellular organisms covering algae and bacteria, followed by a section on water pollution, both fresh water and marine. Finally, a section is included on communities, discussing biotic indices, diversity indices and saprobic indices. The book ends with an addendum section containing other references by title, followed by a list of periodicals cited.--Copyright 1974, Biological Abstracts, Inc.
W76-09860

AIRBORNE DETECTION AND MAPPING OF OIL SPILLS, GRAND BAHAMAS,
Canada Centre for Remote Sensing, Ottawa (Canada), Data Acquisition Div.
J. N. Devilliers.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-238 841, $3.50 in paper copy, $2.25 in microfiche. Canada Centre for Remote Sensing, Dept. Energy, Mines and Resources Data Report 73-7, September 1973. 11 p, 7 fig.

Descriptors: *Oil pollution, *Oil spills, *Mapping, *Remote sensing, *Pollutant identification, *Aerial photography, *Instrumentation, Aircraft, Environmental effects, Water resources, Resources development, Water pollution effects.
Identifiers: *Outer Continental Shelf, Grand Bahamas, Crude oil, Radiometers, Sensors, Infrared sensors, Television, Laser fluorosensors, Fluorosensors.

An airborne exercise is described employing various sensors to investigate their ability to detect and map Louisiana Crude and Naptha oil spills, both by day and by night. It is shown that photographic, infra-red scanning and low light level T.V. all have some ability to detect Louisiana; only infra-red scanning detected naptha. None of these sensors could identify the anomalies as oil. A laser fluorosensor showed promise in detecting oil at night. Further development will be needed to explore the full potential of such a technique. (Sinha-OEIS)
W76-09891

DEVELOPMENT OF A BOAT AND HELICOPTER DEPLOYABLE OIL SLICK SAMPLER,
Marconsult, Inc., Santa Monica, Calif.
A. A. Allen, and L. E. Fausak.
Available from the National Technical Information Service, Springfield, Va., 22161, as AD-A010 199, $4.50 in paper copy, $2.25 in microfiche. Department of Transportation, U.S. Coast Guard Final Report No. CG-D-99-75, May 1975. 46 p, 6 fig, 8 tab, 2 append. DOT-CG-24,828A.

Descriptors: *Oil pollution, *Oil spills, *Sampling, *Instrumentation, Resources development, Water resources, *Pollutant identification, On-site tests, Testing, Boats.
Identifiers: *Oil samplers, Helicopters, Oil films, Oil slicks.

A device for the sampling of water-born oil films ranging from 10-2mm to 10 mm in thickness has been developed. The prototype device is a modified stainless steel testing sieve, normally used in sediment size analysis, into which is placed a sheet of sorbent material. The sampler is suspended from a cable or chain harness and is dipped into an oil slick; the oil film adheres to the stainless steel sieve screen and is absorbed by the sorbent sheet. After retrieval, the sampler is immediately sealed with a clean lid and bottom pan to prevent contamination of the oil sample, and thereby also becomes its own sample container. The results of a limited testing program indicate that the device will collect in excess of the required 50 ml of oil from fresh, thick films, but that samples of five to ten milliliters are more typical of very thin or weathered oil films. The testing pxrogram was limited in that it did not include the use of a helicopter as a sampling platform, nor were laboratory analyses of the collected samples conducted to confirm the sampler's chemical inertness with respect to various oils and solvents. These two areas will be investigated in subsequent Coast Guard testing. Several suggestions are offered to increase the performance and capability of the sampling device. (Sinha-OEIS)
W76-09892

OIL SPILL AND OIL POLLUTION REPORTS, NOVEMBER 1974 - FEBRUARY 1975,
California Univ., Santa Barbara, Marine Science Inst.
F. A. DeWitt, Jr., and P. Melvin.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-242 542, $9.00 in paper copy, $2.25 in microfiche. Environmental Protection Technology Series, Quarterly Report No. EPA-670/2-75-003, May 1975 260 p, numerous ref.

Descriptors: *Bibliographies, *Oil spills, *Oil pollution, *Pollutant identification, *Monitoring, *Remote sensing, *Water pollution effects, Sampling, Water resources Environmental effects, Water quality control, Water resources, Resources development.
Identifiers: *Outer Continental shelf, *Ecological effects, Environmental impact.

The November 1974 - February 1975 Oil Spill and Oil Pollution Reports is the second quarterly compilation of oil spill events and oil pollution report summaries. Presented in the report are: (a) summaries of oil spill events; (b) summaries and bibliographic literature citations; (c) summaries of current research projects; and (d) patent summaries. The summaries and bibliographic citations of articles presented in Section I are grouped according to subject and are then arranged alphabetically by senior author within each subject division. The sources of the summarized material are scientific, technical, and abstracting journals. Section II lists Current Research Project entries appearing in Report I and includes descriptive project information provided upon request by the principal investigators and/or performing organization. All reports and publications are entered in summary form. Current Research Project summaries are grouped according to subject and then arranged alphabetically by senior principal investigator within each subject division. Patent summaries are divided into United States and foreign subsections and arranged alphabetically by inventor in each section. All patent information was obtained from abstract journals. A subject cross index is provided at the end of the report. (Sinha-OEIS)
W76-09896

DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM, FINAL REPORT,
Aerojet Electrosystems Co., Azusa, Calif.

A. T. Edgerton, J. J. Bommarito, R. S. Schwantje, and D. C. Meeks.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-A011 275, $10.00 in paper copy, $2.25 in microfiche. Department of Transportation, United States Coast Guard Final Report No. CG-D-90-75, May 1975. 328 p, 122 fig, 26 tab, 5 append. DOT-CG-22170A.

Descriptors: *Remote sensing, Water resources, *Oil spills, *Prototypes, *California, *Aerial photography, Continental Shelf, Coasts, Seepage, Radar, Microwave, Mapping, Equipment, Water pollution effects, *Pollutant identification.
Identifiers: *Outer Continental Shelf, *Airborne sensors, Sensors, Television, Surveillance, Real-time.

A prototype airborne oil surveillance system was developed for the U. S. Coast Guard. The multisensor system permits real-time day/night, all-weather detection, mapping and documentation of oil spills at sea. The system was installed aboard a Coast Guard HU-16 Albatross and flight tested off the California Coast. Surveillance data were obtained from natural seeps, a series of controlled oil spills, routine shipping and targets of opportunity. The airborne system consists of a sidelooking radar, a passive microwave imager, a multispectral low light level TV, a multichannel line scanner, a position reference system, and a real-time processor/display console. The system reliably detected and mapped oil spills and seeps for conditions ranging from dense undercast to clear, wind speeds from 0 to 26 knots and daytime to total darkness. Test results demonstrate that airborne oil surveillance is practical and the system can be invaluable to other Coast Guard missions. (Sinha-OEIS)
W76-09898

DETERMINING THE CONCENTRATION OF OIL IN WATER SAMPLES BY INFRARED SPECTROPHOTOMETRY. PHASE II. INTERLABORATORY STUDY. VOLUME II,
Naval Ship Research and Development Center, Annapolis, Md.
S. Finger, H. Feingold, E. Timko, and S. Orbach.
Available from the National Technical Information Service, Springfield, Va., 22161, as AD-A011 042, $5.00 in paper copy, $2.25 in microfiche. Naval Ship Research and Development Center Report No. NSRDC 4536, January 1975. 88 p, 27 tab, 16 ref.

Descriptors: *Oil pollution, *Pollutant identification, *Methodology, *Spectrophotometry, Regression analysis, Laboratory tests, Infrared radiation.
Identifiers: *Infrared spectrophotometry.

An interlaboratory study to validate a method for measuring the concentration of oil in water was conducted with the active participation of seven laboratories. The test plan required each laboratory to analyze either 120 samples (a full factorial) or 60 samples (a half fractional factorial). The results of the interlaboratory study indicate that the IR method can be used for the quantitative determination of oil in aqueous solutions. No statistically significant variations with respect to water salinity have been noted. Prediction of individual laboratory performance based on the results are made for concentrations of 10 p/m, 15 p/m and 100 p/m; for sample sizes of 1, 2, 3, and 6; at confidence leves of 80%, 90%, 95% and 98%. A prediction based on the combined results of all laboratories was also made. This prediction is useful as a guide in designing sampling plans and preparing contract specifications. This report has been issued in three (3) volumes. The first contains the highlights of the results; this, the second gives the details of the analysis; and the third, the actual data. (See also W76-09901) (Sinha-OEIS)
W76-09900

DETERMINING THE CONCENTRATION OF OIL IN WATER SAMPLES BY INFRARED SPECTROPHOTOMETRY. PHASE II. INTERLABORATORY STUDY. VOLUME III,
Naval Ship Research and Development Center, Annapolid, Md.
S. Finger, H. Feingold, E. Timko, and S. Orbach.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A011 043, $7.50 in paper copy, $2.25 in microfiche. Naval Ship Research and Development Center Report No. NSRDC 4536, January 1975.

Descriptors: *Oil pollution, *Pollutant identification, *Methodology, *Spectrophotometry, Regression analysis, Laboratory tests, Infrared radiation.
Identifiers: *Infrared spectrophotometry.

An interlaboratory study to validate a method for measuring the concentration of oil in water was conducted with the active participation of seven laboratories. The test plan required each laboratory to analyze either 120 samples (a full factorial) or 60 samples (a half fractional factorial). The results of the interlaboratory study indicate that the IR method can be used for the quantitative determination of oil in aqueous solutions. No statistically significant variations with respect to water salinity have been noted. Prediction of individual laboratory performance based on the results are made for concentrations of 1- p/m, 15 p/m and 100 p/m; for sample sizes of 1, 2, 3, and 6; at confidence levels of 80%, 90%, 95% and 98%. A prediction based on the combined results of all laboratories was also made. This prediction is useful as a guide in designing sampling plans and preparing contract secifications. This report has been issued in three (3) volumes. The first contains the highlights of the results; the second gives the details of the analysis; and this the third, the actual data. (See also W76-09900) (Sinha - OEIS)
W76-09901

SENSORS FOR CONTINUOUS MONITORING OF TOXIC IONS, NUTRIENTS, AND DISSOLVED GASES IN WATER,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
M. S. Shuman, and W. W. Fogleman.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 834 $6.00 in paper copy, $2.25 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Rpt. No. 113, April 1976. 122 p, 14 fig, 9 tab, 398 ref. OWRT B-074-NC(1), 14-31-0001-4157.

Descriptors: *Electrodes, *Metals, *Monitoring, *Measurement, *Pollution identification, *Waste identification, *Potentiometers, Nutrients, Instrumentations, Cadmium, Copper, Iron, Lead, Mercury, Nickel, Silver, Zinc, Cyanide, Ions.
Identifiers: *Toxic ions.

Ion-selective electrodes and a new type of dissolved gas sensor based on piezoelectric crystals were assessed for use in continuous monitoring of water quality. Relevant stream and effluent water quality standards were reviewed in order to define the constraints on the use of these sensors. The use of sensors in continuous monitoring programs in the United States and other countries was also examined and reviewed. The state-of-the-art of ion-selective electrodes for toxic ions, nutrients and dissolved gases in water was reviewed. A tabular summary of electrode characteristics and an extensive bibliography were compiled. Recommendations for the use of these sensors were made with consideration of the practical problems encountered in continuous monitoring. A dissolved gas sensor for carbon dioxide utilizing a coated piezoelectric crystal was fabricated and evaluated. Didodecylamine and dioctadecylamine were useful coating materials but were also sensitive to water vapor and sulfur dioxide. A probe was designed with the crystal isolated from the aqueous sample by a film of polyvinyl chloride, cast Teflon or by a microporous Teflon filter. (Stewart - North Carolina State)
W76-09906

COAST GUARD'S RESPONSE TO SPILLED OIL,
Coast Guard Reserve, Washington, D.C. Office of Research and Development.
R. W. Ard, Jr.
Environmental Science and Technology, Vol 10, No 3, p 239-242, March 1976. 5 fig.

Descriptors: *Remote sensing, *Oil spills, *Pollution identification, *Water quality control, *Environmental effects, Resources development, Water pollution sources, Monitoring, Detection, Sensors, Oil pollution.
Identifiers: Outer Continental Shelf, *Offshore technology, Airborne sensors, In-situ sensors.

The Coast Guard's Office of Research and Development has an extensive remote sensing program to detect oil spills. This program is broken down into two major categories: in-situ and airborne. In-situ sensors are used to survey the immediate area of the sensor and are typically mounted on bridge piers, buoys, and piles. Airborne remote sensing, or using appropriate sensors on an aircraft, can cover tremendous areas over short periods of time and can map the extent of the spill with appropriate documentation for later legal action. Many in-situ sensor concepts have been investigated by the Coast Guard including those that use vapor detectors, various mechanical schemes, and visible, ultraviolet, and infrared detectors. The Coast Guard Research and Development Center is developing a system that will determine the source of a spill with sufficient confidence that violators can be prosecuted. Every promising technique was evaluated for its ability to characterize oils. The most promising techniques have been infrared and fluorescence spectroscopy, gas chromatography, and thin-layer chromatography. The detection probabilities for each method in ten simulated spills involving 63 samples were: infrared 94.4%; fluorescence 91.1%; gas chromatography 91.1%; and thin-layer chromatography 62.9%, for a combined probability of 99.9%. (Sinha-OEIS)
W76-09915

DEPENDENCE OF THE LEVEL OF NITROGENASE ACTIVITY ON THE WATER CONTENT OF THE THALLUS IN PELTIGERA CANINA, P. EVANSIANA, P. POLYDACTYLA, AND P. PRAETEXTATA,
McMaster Univ., Hamilton (Ontario). Dept. of Biology.
K. A. Kershaw.
Can J Bot. 52(6), p 1423-1427, 1974.

Descriptors: Chromatography, *Pollutant identification, *Nitrogen fixation, Monitoring, *Lichens.
Identifiers: Nitrogenase activity, Peltigera-Canina, Peltigera-Evansiana, Peltigera-Polydactyla, Peltigera-Praetextata, Thallus moisture(Lichens), *Peltigera sp.

The rates of nitrogen fixation and the response to changing levels of thallus moisture have been monitored in P. canina (L.) Willd., P. evansiana Gyel., P. polydactyla (Neck.) Hoffm. and P. praetextata (Somm.) Vain., using standard vapor-phase chromatography. Maximum levels of fixation range from 2.96 nmol of ethylene evolved/h mg dry weight in P. evansiana to 1.31 nmol G2H4/h mg dry weight in P. polydactyla. Each species shows a slightly different pattern of fixation response to changing levels of thallus moisture, and the pattern of fixation correlates with the ecological preferences of each species.--Copyright 1974, Biological Abstracts, Inc.
W76-09916

PESTICIDE AND PCB RESIDUE IN ORGANS OF WILD ANIMALS AS INDICATORS OF ENVIRONMENTAL CONTAMINATION, (IN GERMAN),
Munich Univ. (West Germany). Institut fuer Tierphysiologie.
J. Brueggemann, L. Busch, U. Drescher-Kaden, W. Eisele, and P. Hoppe.
Z Jagdwiss. 20(1), p 70-74, 1974.

Descriptors: *Pesticide residues, *Polychlorinated biphenyls, Indicators, Gas chromatography, *Pollutant identification, Environment, *Wildlife.
Identifiers: Bird, Codfish, Liver.

During the years 1970-1973, 800 samples of organs, adipose tissue and eggs from 26 wild animal species were investigated using gas chromatography with respect to chlorinated pesticides and polychlorinated biphenyls (PCB). The most abundant pesticides were HCB and Lindane + isomers. The pesticide- and PCB-concentrations in liver- and fat tissue of herbivores were about 5 times lower (ppb-values) than in carnivores, where the residues accumulated according to the food chain. The highest values gotten from eggs of predatory birds and from codfish liver (ppm-values Tab. 2 and 3; for instance DDE and DDT + isomers).--Copyright 1974, Biological Abstracts, Inc.
W76-09922

A SIMPLE PHYSICOCHEMICAL METHOD OF DETECTING TRACES OF SURFACTANTS IN WATER,
Florence Univ. (Italy). Dept. of Physical Chemistry.
R. Cini, A. Ficalbi, and G. Loglio.
Mikrochim Acta 2, p 203-212, 1974.

Descriptors: *Surfactants, *Pollutant identification, *Physicochemical properties, Water quality, Organic compounds, Trace elements.

A physical-chemical method of detecting traces of surfactants (both natural and synthetic) in water is described. This method is based on the measurement of the surface pressure on water samples containing surfactants with molecular weight higher than 150-200, in concentration lower than 2 ppm. In well-defined conditions, the method can yield also quantitative results. Typical results for dimethyldecylphosphine oxide (DC10PO), dimethyldodecylphosphine oxide (DC12PO), isooctylphenoxypolyethoxyethanol(Triton · X-100) and sodium dodecylsulfate are reported. A new parameter is proposed to indicate the quality of water with respect to surfactants.--Copyright 1974, Biological Abstracts, Inc.
W76-09927

TECHNIQUE OF WATER SAMPLING IN SANITARY INVESTIGATIONS OF LARGE BODIES OF WATER, (IN RUSSIAN),
Kazan Inst. of Postgraduate Medicine (USSR).
L. N. Krepkogorskii, and Y. N. Pochkin.
Gig Sanit. 38(7), p 72-75, 1973.

Descriptors: *Sampling, Water pollution, *Pollutant identification, *Water analysis, Chemical analysis, Bottom sampling, *Water sampling.

The described water sampler greatly shortens the time required for taking water samples during sanitary investigations of bodies of water. It takes 2 persons 40-50 min to take 6 samples for complete sanitary-chemical, bacteriological, and special analyses (filling of 42 glass bottles) on a 400-800 m wide river at 3 points (near the left bank, middle, and near the right bank; surface and deep or bottom samples are taken at each point). The design of the water sampler eliminates secondary contamination of the sample for bacteriological investigations.--Copyright 1974, Biological Abstracts, Inc.
W76-09928

GAS-LIQUID CHROMATOGRAPHIC DETERMINATION OF BUTYL ACETATE, BUTANOL AND ACETONE PRESENT TOGETHER IN WASTE WATERS, (IN RUSSIAN),
Kiev Medical Preparatory Plant (USSR).
M. S. Komskii, and M. A. Bogatskii.
Gig Sanit. 38(9), p 70-71, 1973.

Descriptors: *Pollutant identification, Methodology, *Gas chromatography, Organic compounds, Analytical techniques.
Identifiers: Acetates, Acetone, Butanol, Butyl acetate.

A rapid, sensitive gas-liquid chromatographic method was developed for quantitative determination of butyl acetate, butanol and acetone present together in waste waters. The determination of all 3 components takes 15 min. The analysis is performed on a gas chromatograph using flame-ionization detector. The sensitivity of the method is 0.2 micro-g of butyl acetate or butanol and 0.05 micro-g of acetone in the analyzed sample.--Copyright 1974, Biological Abstracts, Inc.
W76-09929

'TOXIC' OR 'POISONOUS' WATER, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.
For primary bibliographic entry see Field 5C.
W76-09932

USING A CHN ANALYZER TO REDUCE CARBONATE INTERFERENCE IN PARTICULATE ORGANIC CARBON ANALYSES,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
G. Telek, and N. Marshall.
Mar Biol (Berl). 24(3), p 219-221, 1974.

Descriptors: *Pollutant identification, *Carbonates, Water analysis, Carbon, Nitrogen, Hydrogen, Oxidation.
Identifiers: *Organic carbon, *CHN analyzer.

Using a CHN analyzer at a reduced temperature (720C), the organic carbon of particulates taken from water is oxidized while little dissociation of carbonate occurs. When necessary for increased precision or for samples with a high CaCO3 content, the small interference of carbonate with organic C determinations can be quantified by running representative samples at different oxidation time intervals and interpolating to time zero. By running replicates, one at 720C and one at 1100C, data on organic and inorganic C and on N are obtained with the analyzer.--Copyright 1974, Biological Abstracts, Inc.
W76-09940

5B. Sources Of Pollution

EFFECTS OF STORM DISCHARGES ON RIVER WATER QUALITY,
Water Pollution Research Lab., Stevenage (England).
J. H. N. Garland.
Berichte der Abwassertechnischen Vereinigung e.V., No. 28, p 593-602, 1976. 4 fig, 2 tab, 13 ref.

Descriptors: *Storm runoff, *Water pollution source, Rivers, Sewage treatment, Sewerage, Suspended solids, Weirs.

In 1963 about 37% of the storm overflows in Wales and England were considered unsatisfactory. Pollution problems from storm sewage most frequently appeared where overflow settings were below six times dry-weather flow, usually older industrial urban areas where substantial parts of sewage systems had outlived their original design capacity. Considerable deterioration of water quality in the River Tame resulted from storm overflows and surface drainage. A realistic approach to the problem is that of treating the entire river below the last large Effluent outfall using a series of several settling basins. The effect of storm sewage discharge on a river depends primarily on the discharge's duration and strength and the dilution provided by the river. Its strength depends on dry-weather sewage, time of day, time since the last storm, and the flow. In combined sewerage systems, a flood wave precedes the mixed sewage and may cause spillage of dry-weather sewage. If a long time has elapsed since the last rainfall, storm runoff in the first flush may contain very large amounts of suspended solids which had accumulated on surfaces. Discharge duration depends intensity and duration of the rainfall, how the overflow weir is set, and the drainage system's storage capacity. The overflow weir setting has the greatest effect on the frequency of pollution episodes. Another problem is posed by metals, such as zinc, copper, and lead, contained in dust entering urban rivers with runoff. The River Tame shows two types of polluted conditions: one caused by inadequate treatment of effluents, and the other caused by additional pollutants entering during storms. (Snyder-FIRL)
W76-09401

URBAN DRAINAGE STUDIES,
Environmental Protection Service, Ottawa (Ontario).
T. M. Koplyay.
Water and Pollution Control, Vol. 114, No. 1, p 14-16, January, 1976. 1 fig, 2 tab.

Descriptors: *Urban drainage, *Storm runoff, Water pollution sources, Model studies, Snowmelt, Storm drains, Combined sewers, Drainage systems.
Identifiers: Storm Water Management Model.

New approaches to designing and constructing systems to convey surface waters are being examined, due to increasing land servicing costs. Loss of pervious ground due to land development results in increased storm flow velocities and higher peak flows, causing local flooding. The higher velocities also increase the pollution and sediment loads. The Canada/Ontario urban drainage program was set up to define the stormwater problem in the Canadian Great Lakes region, establish priorities and schedules for studies, and develop a strategy for implementing solutions. A study is being conducted to provide an order of magnitude estimate of pollution loadings from urban runoff. Problem identification efforts also include reviewing existing municipal practices in Ontario. The Storm Water Management Model (SWMM) ofthe United States Environmental Protection Agency is being adapted to Canadian conditions. Several data collection projects provide site calibration data, and a sub-routine dealing with snowmelt phenomena is being added. Problems with storm sewers and combined sewers in the United States and Europe were studied. Efforts are being made to ascertain that foreign technical practices will be assessed in terms of their applicability in Canada. An ideal model for regulatory practices will be developed. (Snyder-FIRL)
W76-09402

ENVIRONMENTAL POLLUTION BY CADMIUM AND ZINC DISCHARGED FROM A BRAUN TUBE FACTORY, (IN JAPANESE)
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
T. Asami.
Sci Rep Fac Agric Ibaraki Univ. 22, p 19-24, 1974.

Descriptors: *Cadmium, *Zinc, Water pollution sources, Waste water(Pollution), *Industrial wastes, Effluents, Sediments.
Identifiers: Soil pollution, Braun tube factory wastes, *Japan.

Cd and Zn discharges from a braun tube factory at Funabashi city, Chiba Prefecture, Japan, were investigated. Sediment of one wastewater outlet contained 9770 ppm Cd and 37,500 ppm of Zn; that of the other contained 4820 ppm Cd and 15,500 ppm Zn. Slag from settling tank thrown on a roadside near an outlet contained 45,500 ppm Cd and 170,000 ppm Zn. The soil even 4 m under the road surface contained 186 ppm Cd and 662 ppm Zn. Sediments in the irrigation canal polluted by the factory waste water contained much Cd and Zn; paddy soils near the canal were polluted by the metals. Houses near the factory were polluted by Cd carried by dust from the slag thrown on the roadside. Surface soil of a yard contained 9.8 ppm Cd. Dust from the nearest house contained 76.5 ppm Cd; the amount of Cd in the dust decreased gradually in proportion to distance from the factory.--Copyright 1976, Biological Abstracts, Inc.
W76-09405

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: PENN STATE EXPERIMENTAL WATERSHEDS,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 4D.
W76-09463

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: BALTIMORE, MARYLAND, MUNICIPAL WATERSHEDS,
Northeastern Forest Experiment Station, Pennington, N.J.
For primary bibliographic entry see Field 4D.
W76-09464

EFFECTS OF MANAGEMENT PRACTICES ON WATER QUALITY AND QUANTITY: NEWARK, NEW JERSEY, MUNICIPAL WATERSHEDS,
Northeastern Forest Experiment Station, Pennington, N.J.
For primary bibliographic entry see Field 4D.
W76-09465

CHANGES IN WATER CHEMISTRY RESULTING FROM SURFACE-MINING OF COAL ON FOUR WEST VIRGINIA WATERSHEDS,
Forest Service (USDA), Berea, Ky. Northeast Forest Experiment Station.
For primary bibliographic entry see Field 4C.
W76-09470

FOREST MANAGEMENT PRACTICES AS RELATED TO NUTRIENT LEACHING AND WATER QUALITY,
Northeastern Forest Experiment Station, Pennington, N. J.
For primary bibliographic entry see Field 4C.
W76-09471

DISCUSSION OF POSSIBLE EFFECTS DUE TO MIXING OF RADIOACTIVE AND THERMAL RELEASES TO THE ATMOSPHERE FROM NUCLEAR POWER PLANTS,
Kernforschungszentrum, Karlsruhe (West Germany).
For primary bibliographic entry see Field 5A.
W76-09502

CHARACTERISTICS OF COASTAL CIRCULATION AFFECTING THE TRANSPORT AND DISPERSION OF MATERIAL RELEASED FROM THE NUCLEAR INDUSTRY,
Energy and Research and Development Administration, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-09504

OPTIMAL GROUND WATER QUALITY MANAGEMENT: WELL INJECTION OF WASTE WATERS,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W76-09511

A THREE-DIMENSIONAL GALERKIN FINITE ELEMENT SOLUTION OF FLOW THROUGH MULTIAQUIFERS IN SUTTER BASIN, CALIFORNIA,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 2F.
W76-09562

NUMERICAL SIMULATION OF WASTE MOVEMENT IN STEADY GROUNDWATER FLOW SYSTEMS,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
J. F. Pickens, and W. C. Lennox.
Water Resources Research, Vol. 12, No. 2, p 171-180, April 1976. 10 fig, 1 tab, 24 ref.

Descriptors: *Model studies, *Groundwater movement, *Underground waste disposal, Groundwater, Waste disposal, Water pollution, Water pollution sources, *Path of pollutants, Mathematical models, Finite element analysis, Analytical techniques, Wastes, Waste disposal wells, Flow, Flow system, Water table, Infiltration.

The finite element method based on a Galerkin technique was used to formulate the problem of simulating the two-dimensional transient movement of conservative or nonconservative wastes in a steady state saturated groundwater flow system. The convection-dispersion equation was solved in two ways: in the conventional Cartesian coordinate system and in a transformed coordinate system equivalent to the orthogonal curvilinear coordinate system of streamlines and normals to those lines. The two formulations produced identical results. A sensitivity analysis on the dispersion parameter 'dispersivity' was performed, establishing its importance in convection-dispersion problems. Examples involving the movement of nonconservative contaminants described by distribution coefficients and examples with variable input concentration were also given. The model can be applied to environmental problems related to groundwater contamination from waste disposal sites. (Sims - ISWS)
W76-09564

THE CONCENTRATION OF DISSOLVED SOLIDS AND RIVER FLOW,
Manhattan Coll., Bronx, N. Y. Dept. of Civil Engineering.
D. J. O'Connor.
Water Resources Research, Vol. 12, No. 2, p 279-294, April 1976. 15 fig, 2 tab, 18 ref.

Descriptors: *Dissolved solids, *River flow, *Mathematical studies, *Streamflow, Water properties, *Water chemistry, Salts, Chemical properties, Discharge(Water), Time, Runoff, Mathematics, Hydrologic data, Equations, Flow characteristics, Distribution patterns, Graphical analysis, Natural streams, *Path of pollutants, *Ohio.
Identifiers: *Muskingum River(Ohio), Point sources, Steady state conditions, Time variable conditions, Nonpoint sources, Distributed sources, Flow-concentration relationships.

A general expression for the spatial and temporal distribution of conservative dissolved solids in freshwater rivers which incorporates the contribution of both the groundwater and surface water components of river flow was presented. The first part of this paper deals with the steady state conditions. With certain simplifying assumptions the correlation between concentration of dissolved solids and flow was developed for both spatially uniform and nonuniform conditions. The analysis includes the effect of both geophysical discontinuities and point sources. Examples from a number of rivers throughout the country were presented to indicate the utility of the analysis. The second part addresses the temporal variation of the dissolved solids concentration for two time scales. One described the annual variation in concentration due to the time variable components of the river flow, and the second the variation over a semimonthly period due to a time variable point input. Applications to a variety of river conditions were also presented for the time variable analysis. (Henley-ISWS)
W76-09577

WATER CHEMISTRY OF THE ST. LAWRENCE ESTUARY,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
For primary bibliographic entry see Field 5A.
W76-09581

MODELING THE CHESAPEAKE BAY AND TRIBUTARIES: A SYNOPSIS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 2L.
W76-09587

LONGITUDINAL DISPERSION COEFFICIENTS FOR STREAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
S. C. Jain.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 102, No. EE2, Proceedings Paper 12037, p 465-474, April 1976. 5 fig, 2 tab, 10 ref, 3 append.

Descriptors: *Dispersion, *Water pollution sources, *Velocity, *Hydraulics, Environmental engineering, Open channel flow, Rivers, Theoretical analysis, Cross-sections, Mixing, Mathematical models, *Path of pollutants, *Missouri River.
Identifiers: Transverse mixing coefficient.

The coefficient of longitudinal dispersion is an important parameter which characterizes the ability of a stream to reduce the concentration of pollutants along the channels. Field determination of this dispersion coefficient is very time consuming and costly. Using the Fischer formula for variation in the velocity distribution in the transverse direction, an analytical expression was obtained for the dispersion coefficient in terms of a dimensionless parameter, transverse mixing coefficient, shear velocity and average flow velocity, and top width of channel and area of flow cross section. An expression for the dimensionless parameter for an idealized tetragonal cross section was derived. The estimate for the dispersion coefficient for a reach of the Missouri River by the proposed method was shown to be in fair agreement with the observed value. (Singh-ISWS)
W76-09589

STUDIES ON THE METABOLISM OF A SULFUR-OXIDIZING BACTERIUM. VII. PURIFICATION AND CHARACTERIZATION OF SOLUBLE COMPONENTS INDISPENSABLES FOR SULFUR OXIDATION BY THIOBACILLUS THIOOXIDANS,
Nagoya Univ. (Japan). Biological Inst.
For primary bibliographic entry see Field 5C.
W76-09592

PHOSPHORUS AND NITROGEN CYCLE ON A TRANSECT IN LAKE ONTARIO DURING THE

INTERNATIONAL FIELD YEAR 1972-1973 (IFYGL),
Canada Centre for Inland Waters, Burlington (Ontario). Applied Limnology and Physical Processes Section.
For primary bibliographic entry see Field 5C.
W76-09594

THE DESIGN OF WATER QUALITY MANAGEMENT PROJECTS WITH INADEQUATE DATA,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 5G.
W76-09623

DEVELOPMENT OF LABORATORY MODEL ECOSYSTEMS AS EARLY WARNING ELEMENTS OF ENVIRONMENTAL POLLUTION,
Illinois Univ. at Urbana-Champaign.
For primary bibliographic entry see Field 5C.
W76-09643

ECOSYSTEM MODELING,
Utah State Univ., Logan.
For primary bibliographic entry see Field 5C.
W76-09645

MICROBIAL DEGRADATION OF MODEL PETROLEUM AT LOW TEMPERATURES,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-09648

SPECIES COMPOSITION AND DIVERSITY OF POLYCHAETES IN THE NEW YORK BIGHT,
Pacific Northwest Environmental Research Lab., Newport, Oreg. Marine Science Center.
For primary bibliographic entry see Field 5C.
W76-09650

NITROGEN IN THE SUBSURFACE ENVIRONMENT,
East Central Oklahoma State Univ., Ada. School of Environmental Science.
M. L. Rowe, and S. Stinnett.
Environmental Protection Agency, Report EPA-660/3-75-030, June, 1975. 34 p, 1 fig, 106 ref. EPA Program Element 1BA024. R801381.

Descriptors: *Nitrogen, *Nitrogen compounds, *Water pollution, *Groundwater, Nitrification, Denitrification, Fertilizers, Farm wastes, Domestic wastes, Public health, *Path of pollutants.
Identifiers: *Nitrogen contamination, Methemoglobinemia.

Increased quantities of nitrogen are being released into the soil system. Consequently, higher concentrations of nitrogeneous compounds are making their way into subsoil regions. Knowledge of the behavior and fate of nitrogeneous chemical species in the subsurface environment is needed by those concerned with the prevention and control of ground-water pollution. Any nitrogen compound can be leached if the proper conditions exist. Compounds of nitrogen can move through pore spaces of soil as gases or as solutes in an aqueous solution. Nitrification and denitrification reactions occur in the soil system and are dependent on factors such as soil texture, moisture, temperature and pH. Nitrogen contamination of ground-water supplies is due to agricultural fertilizers, animal wastes, domestic wastes and natural sources. A potential health hazard does exist from the ingestion of nitrate in water supplies. The most apparent danger is to infants less than six months of age, but the nitrate ion could cause methemoglobinemia in adults if it is present in sufficient concentrations. (Heiss-NWWA)
W76-09662

EVALUATION OF COMBINED APPLICATIONS OF ULTRAFILTRATION AND COMPLEXATION CAPACITY TECHNIQUES TO NATURAL WATERS,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5A.
W76-09690

STEROIDS IN EFFLUENTS,
Clyde River Purification Board, Glasgow(Scotland).
For primary bibliographic entry see Field 5A.
W76-09696

DISTRIBUTION OF BDELLOVIBRIO BACTERIOVORUS IN SEWAGE WORKS, RIVER WATER, AND SEDIMENTS,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
For primary bibliographic entry see Field 5A.
W76-09698

ACID-IRON WASTE AS A FACTOR AFFECTING THE DISTRIBUTION AND ABUNDANCE OF ZOOPLANKTON IN THE NEW YORK BIGHT: I. LABORATORY STUDIES ON THE EFFECTS OF ACID WASTE ON COPEPODS,
Harvard Univ., Cambridge, Mass. Biological Labs.
For primary bibliographic entry see Field 5C.
W76-09700

EFFECTS OF LAND USE AND RIVER SEEPAGE ON GROUNDWATER QUALITY IN HALL COUNTY, NEBRASKA,
Nebraska Univ., Lincoln. Inst. of Agriculture; and Nebraska Univ., Lincoln. Div. of Natural Resources, Conservation and Survey.
R. F. Spalding.
Nebraska Water Survey Paper Number 38, January 1975. 95 p, 17 fig, 2 tab, 60 ref, 5 append.

Descriptors: Water pollution, *Groundwater, *Farm wastes, *Sewage effluents, *Fertilizers, Phosphates, Nitrates, Nitrogen, Chlorides, Sulfates, *Land use, Subhumid climates, Evaporation, Irrigation, Evapotranspiration, Water table, Recharge, Infiltration, Groundwater movement, Wells, Water levels, Sampling, Specific conductivity, Leaching, Septic tanks, Hydrogen ion concentration, Seepage, *Nebraska.
Identifiers: *Ogallala formation(Neb), Soil maps, Nitrogen balance, *Platte River seepage(Neb).

Zones of differing groundwater quality have been delineated in Hall County. Concentrations of sulfates ranged from about 250 mg/l beneath the Platte River bottomlands to greater than 500 mg/l in a broad terrace north of the river. Sulfates in the bottomlands were attributed to infiltration of river water which has concentrations of about 250 mg/l sulfates. High sulfate concentrations beneath the terrace are attributed to leaching of water, accelerated by infiltrating irrigation water, through layers of gypsum in the overlying soils. Nitrate concentrations are variable. Contribution of nitrates from anhydrous ammonia fertilizer application was related to soil types. Leachate from manure accumulations and from septic tanks accounts for some locally high concentrations of nitrate. Seepage from the Platte River has a diluting effect on the nitrate influx to bottomland groundwater. There is a tendency for nitrate concentrations to increase with time. (Schicht-ISWS)
W76-09728

USE OF THE COMPUTER PROGRAM 'STORM' FOR ANALYSIS OF THE QUANTITY AND QUALITY OF URBAN STORM WATER RUNOFF,
Hydrologic Engineering Center. Davis, Calif.
A. D. Feldman, and J. W. Abbott.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 125-134, October 1974. 3 fig, 2 tab, 9 ref.

Descriptors: *Model studies, *Urban runoff, *Water quality, *Flow, Storm runoff, Overflow, Treatment, Computer programs, Mathematical models, Runoff, Rainfall, Storage, Discharge(Water), Pollutants, Water pollution, Cities, Urban hydrology.

The quantity and quality of urban storm water runoff can be analyzed on a continuous (hourly) basis by the computer program STORM, to aid in the selection of the storage capacities and treatment rates required to achieve desired control of urban storm water runoff. The model considers the interaction of eight storm water elements: precipitation, snowfall and snowmelt, runoff, land surface erosion, pollutant accumulation, storage capacity, treatment rate, and overflows from the storage/treatment system. In this approach, dust and dirt and the associated pollutants are washed from the watershed into gutters and storm sewers. The resulting storm water runoff is diverted (for treatment) at rates not exceeding the specified treatment rate. Runoff in excess of the treatment rate is diverted into storage for subsequent treatment. Runoff in excess of both the treatment rate and storage capacity (overflow) is diverted directly into receiving waters. The quantity and quality of this untreated water (for each combination of storage capacity and treatment rate) is assessed. The quantity and quality of overflows from the storage/treatment facility were assessed for an urban watershed near Oakland, California. (See also W76-09729) (Sims - ISWS)
W76-09740

COMBINED SEWAGE OVERFLOWS - FREQUENCY, ENVIRONMENTAL EFFECTS, AND A CORRECTIVE PROGRAM,
Clinton Bogert Associates, Fort Lee, N. J.
For primary bibliographic entry see Field 5D.
W76-09741

CONCENTRATION OF HEAVY METALS IN SEDIMENTS OF A HYDROELECTRIC IMPOUNDMENT,
Montana Univ., Missoula, Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W76-09755

CHARACTERIZATION OF NITROGEN SOURCES CONTAMINATING SHALLOW GROUND WATER IN AN ARID BASIN. LAS VEGAS AREA, NEVADA,
Nevada Univ., Reno. Center for Water Resources Research; and Nevada Univ., Reno. Desert Research Inst.
R. O. Patt, and J. W. Hess.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 545, $4.50 in paper copy, $2.25 in microfiche. Technical Report Series H-W, Publication No. 26, February 1976. 44 p, 7 fig, 5 tab, 45 ref, append. OWRT A-063-NEV(1) 14-31-0001-5028.

Descriptors: *Nitrates, Nitrogen, Organic Soils, *Aquifers, *Groundwater mining, Hydrogeology, *Nevada, Arid lands, Water wells, Water pollution sources, Fertilizers, *Geochemistry.
Identifiers: *Las Vegas Valley(Nev).

The problem of high nitrate concentration in shallow ground water in the Las Vegas Valley, Nevada first became apparent in 1972 when Health Department officials reported nitrate concentrations of up to 449 mg/litre in domestic wells of the area. Possible sources for these high nitrate levels include nitrogen fertilizer, septic system leachates, animal corral leachates, and buried natural organic materials. An initial study was made of the geolo-

gy, hydrology, and ground-water geochemistry of the area to characterize potential nitrogen sources of ground-water contamination. High nitrate concentrations in the ground water are between first water and approximately 61 m, though exact thickness of this zone is unknown. There is no evidence to date to indicate nitrate contamination of lower aquifer zones. Natural nitrate producing sources have not been ruled out or proven as the source of the nitrate pollution in the area. All new wells in the area should be drilled to a depth of at least 137 m and sealed for at least the first 61 m. Old wells, as they are phased out, should be properly sealed to minimize opportunity for leakage between aquifer zones. (Fallon-Nevada)
W76-09762

SEDIMENT PROPERTIES, LAKE CHAMPLAIN: 1971-1975,
Vermont Univ., Burlington. Dept. of Geology.
A. S. Hunt.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 546, $5.00 in paper copy, $2.25 in microfiche. Vermont Water Resources Research Center, Burlington, Completion Report, August 1975. 85 p, 7 fig, 7 tab, 16 ref. OWRT A-015-VT(1) 14-31-1-5046.

Descriptors: Cobalt, Copper, Zinc, Iron, Manganese, Lead, Titanium, *Lake sediments, Sediments, *Trace elements, Lakes, *Vermont, Industrial wastes, *Pollutant identification, Distribution, *Path of pollutants, Chromium, Nickel.
Identifiers: *Lake Champlain.

Analysis of the minor elements iron, manganese, and titanium, and the trace elements chromium, cobalt, copper, nickel, zinc, and lead has provided information on the distribution and concentration of these substances in the sediments of Lake Champlain. All trace elements concentrations were similar to those of Southern Lake Michigan except cobalt which was considerably higher. Lake Champlain was found to have relatively high surface values for chromium and nickel in the Ticonderoga area and Malletts Bay which have been attributable to industrial pollution. Surface sediment enrichment was found to occur with lead, zinc, and, to a lesser degree, copper throughout much of the Lake. Although the evidence is not conclusive it is most probable that the sediments have derived their characteristics primarily from transport of particulate material into the basin rather than from adsorption from overlying water or upward migration within the sediment column.
W76-09763

TRANSFORMATION OF CONCENTRATED AND COMPLEX PHOSPHORUS FERTILIZERS IN MODOW-BOG SOIL WITH A HIGH MOISTURE CONTENT, (IN AZERBAIJANI),
R. K. Guseinov, and F. G. Akhundov.
Izv Akad Nauk Az SSR Ser Biol Nauk. 4, p 48-52, 1974.

Descriptors: *Phosphorus, *Fertilizers, *Moisture content, Flooding, *Phosphates, Soils, Soil moisture.

A study of the transformation of P fertilizers in soil under laboratory conditions of flooding with water showed that the P of Nitrophoska, Ammo-Phos and double super-phosphate on interacting with the soil is absorbed less than the P of simple super-phosphate. The lesser fixation of P in soil and high content of readily assimilable forms provide greater availability of these fertilizers.--Copyright 1975, Biological Abstracts, Inc.
W76-09786

RADIATION HAZARD OF IODINE-129, (IN RUSSIAN),
Y. I. Moskalev, and I. Y. Vasilenko.
Gig Sanit. 2, p 80-83, 1975.

Descriptors: Iodine, *Radioisotopes, Radioactivity, *Path of pollutants, Environmental effects, Food chains, Cycles, Reviews, Air pollution effects.
Identifiers: Biosphere, *Iodine-129.

A review is presented of the literature on the radiation hazard of I-129, global fallout, discharges of nuclear reactors and plants of the atomic industry, local fallout due to air and ground nuclear explosions, accumulation of I-129 in natural environments, metabolism and migration in the biosphere and content in main food products (bread, meat, milk and vegetables).--Copyright 1975, Biological Abstracts, Inc.
W76-09788

PRESENCE AND SOME PROPERTIES OF BACTERIA OF THE FAMILY PSEUDOMONADACEAE IN THE RIVER DANUBE, (IN GERMAN),
Slovenska Akademie Vied, Bratislava Czechoslovakia). Limnobiologisches Institut.
For primary bibliographic entry see Field 5A.
W76-09792

ANTHROPOGENIC EFFECT ON CONTINENTAL, MARINE, AND OCEANIC BIOHYDROCOENOSES, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W76-09819

BALANIDAE AS POLLUTION INDICATORS IN THE BAY OF GUANABARA, (IN PORTUGUESE),
Instituto Oswaldo Cruz, Rio de Janeiro (Brazil).
For primary bibliographic entry see Field 5A.
W76-09823

RECONNAISSANCE MAP SHOWING RELATIVE AMOUNTS OF SOIL AND BEDROCK IN THE MOUNTAINOUS PART OF THE MORRISON-EVERGREEN QUADRANGLES AND ADJOINING AREAS TO THE WEST IN JEFFERSON COUNTY, COLORADO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-09825

OPEN-LOOP WATER-WASHABLE INSPECTION PENETRANT PROCESS,
For primary bibliographic entry see Field 5D.
W76-09859

BIOLOGICAL INDICATORS OF ENVIRONMENTAL QUALITY. A BIBLIOGRAPHY OF ABSTRACTS,
For primary bibliographic entry see Field 5A.
W76-09860

CALCULATION OF WATER TEMPERATURES IN CLEAR LAKE, IOWA,
Ichthyol. Assoc., Berwick, Pa. Icthyological Associates, Inc., Berwick, Pa.
T. V. Jacobsen, and R. W. Bachmann.
Iowa State J Res. 48(4), p 285-290, 1974.

Descriptors: *Water temperature, Lakes, *Iowa, *Regression analysis, Treatment facilities, *Air temperature, New York, Indiana, Equations.
Identifiers: *Clear Lake(Iowa).

A 16-yr series of daily water temperature readings from the Clear Lake Water Treatment Plant was used to develop a regression equation for the calculation of lake water temperatures during the ice-free portion of the year. Daily maximum and minimum air temperatures from a local observation station were used as the independent variables. The relationship that gave the minimum standard deviation from regression was Y equal 1.40 plus 0.980 X, where Y is the estimated water temperature (C) on a given day and X is the average of the maximum plus minimum daily air temperatures (C) on that day and the previous 9 days. Daily water temperatures can be calculated with a standard deviation of 1.84 C by use of the equation. Similar relationships were developed for Oneida Lake, New York, Lake Maxinkuckee, Indiana, and Big Spirit Lake.--Copyright 1974, Biological Abstracts, Inc.
W76-09879

THE HYGIENIC QUALITY OF THE WATER IN A GROWING-FINISHING PIGGERY, (IN ROMANIAN),
Institutul Agronomic Dr. Petru Groza, Cluj (Rumania).
T. Buhatel, and G. Pura.
Inst Agron Dr, Petru Groza Cluj Lucr Stiint Ser Med Vet. 27, p 341-348, 1971.

Descriptors: Water quality, *Farm wastes, *Nitrates, *Nitrites, *Ammonium, Organic matter, *Microorganisms, *Bacteria, Coliforms, Streptococcus, Potable water, Fungi, Potassium, Water pollution sources.
Identifiers: Anaerobes, Manganate, *Piggery wastes, Spores, Staphylococcus.

A study of the hygienic quality of the water in a growing-fattening piggery showed that the degree of impurity was: at source (ammonium 0.05 mg/1; nitrites 0.002 mg/1; nitrates 63 mg/1; coliform index 200/1); on the water supply circuit (ammonium 0.28 mg/1; nitrites 0.01; organic substances 23 mg KMnO 4/1; coliform index 280/1); and in the watering troughs (ammonium 1.1. mg/1; nitrites 0.77 mg/1; nitrates 81 mg/1; organic substances 302 mg KMnO 4/1; total number of microorganisms 5 x 108/ml; coliform index 4 x 108/1 and fungal spores 9 x 104/ml). Determinations of the main microorganism groups (staphylococci, streptococci, coliforms, anaerobes and funji) in the water of the drinking troughs with continuous and intermittent flows indicated a larger microorganism population in the troughs with intermittent flow where a correction of the potability of the water is necessary.--Copyright 1975, Biological Abstracts, Inc.
W76-09883

HYGIENIC STANDARDIZATION OF FLOTATION REAGENT BB-2 AND ITS COMPONENTS AS INDUSTRIAL CONTAMINANTS OF WATER BODIES, (IN RUSSIAN),
Kazanskii Gosudarstvennyi Meditsinskii Institut (USSR).
A. V. Ivanov.
Gig Sanit. 38(9), p 14-19, 1973.

Descriptors: *Industrial wastes, Flotation, *Water quality standards, Organoleptic properties, Water pollution.
Identifiers: *Flotation reagent BB-2.

Standards for the maximum permissible concentrations of flotation reagent BB-2 should be set at a level of 2.4 mg/l according to organoleptic signs of noxiousness. Using the same criteria, the maximum permissible concentrations for the components of BB-2 are recommended to be 0.44 mg/l for 1,2-pentadiole, 0.40 mg/l for 1,5-pentadiole and 0.79 mg/l for 1,4,5-pentantriole. Experiments to determine the LD50 were carried out with mice, rats, guinea pigs and rabbits.--Copyright 1975, Biological Abstracts, Inc.
W76-09886

ASSESSING POTENTIAL OCEAN POLLUTANTS,
National Academy of Sciences, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-09889

AIRBORNE DETECTION AND MAPPING OF OIL SPILLS, GRAND BAHAMAS,
Canada Centre for Remote Sensing, Ottawa (Canada), Data Acquisition Div.
For primary bibliographic entry see Field 5A.
W76-09891

OIL SPILL AND OIL POLLUTION REPORTS, NOVEMBER 1974 - FEBRUARY 1975,
California Univ., Santa Barbara, Marine Science Inst.
For primary bibliographic entry see Field 5A.
W76-09896

COASTAL WATER RESEARCH PROJECT. ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 1975,
Southern California Coastal Water Research Project, El Segundo, Calif.
Southern California Coastal Water Research Project, Annual Report for the Year Ended 20 June 1975, 1975. 215 p, 47 fig, 40 tab, 1 ref, 4 append.

Descriptors: *Ecosystems, *Environmental effects, *Pollutant identification, *Resources development, *Water resources, *Water pollution sources, *Water pollution effects, *Water quality control, *Coasts, Continental shelf, Biology, Fish diseases, Toxicity, Invertebrates, Metals, Engineering, Management, Facilities.
Identifiers: *Outer Continental Shelf, Trace metals, Chlorinated hydrocarbons, Environmental impact.

The Coastal Water Research Project was organized in 1969 to make scientific studies of the problems of pollution in the coastal waters of California, especially those associated with the discharge of municipal wastes. The goal is to become expert on the subject of ocean pollution by making and reporting careful measurements of the quantities and movements of pollutants and of their effects. The special value of this project comes from looking 'beyond the ends of the pipes' at the regional ecological situation and trying to determine the effects of all factors that influence marine life so that any changes can be seen in the true perspective of natural biological variability and other acts of man. This report describes the main points of progress during the fiscal year ending 30 June 1975. Research, including extensive work at sea and in the laboratories is discussed; findings are summarized as a list of partial answers to key questions; and persons involved and the funds spent are listed. Separate reports are included on: the biology program; toxicity; invertebrate ecology; fish ecology; chemical pollutants; engineering program; and management and facilities. (Sinha-OEIS)
W76-09899

DETERMINING THE CONCENTRATION OF OIL IN WATER SAMPLES BY INFRARED SPECTROPHOTOMETRY. PHASE II. INTERLABORATORY STUDY. VOLUME II,
Naval Ship Research and Development Center, Annapolis, Md.
For primary bibliographic entry see Field 5A.
W76-09900

DETERMINING THE CONCENTRATION OF OIL IN WATER SAMPLES BY INFRARED SPECTROPHOTOMETRY. PHASE II. INTERLABORATORY STUDY. VOLUME III,
Naval Ship Research and Development Center, Annapolid, Md.
For primary bibliographic entry see Field 5A.
W76-09901

OIL IN THE ARCTIC,
Massachusetts Inst. of Tech. Cambridge.
For primary bibliographic entry see Field 5C.
W76-09902

OPERATIONAL MODEL FOR PREDICTING THE MOVEMENT OF OIL IN CANADIAN NAVIGABLE WATERS,
Canada Centre for inland Waters, Burlington (Ontario).
T. J. Simons, G. S. Beal, K. Beal, E. Shaarawi, and T. S. Murty.
Marine Sciences Directorate Manuscropt Report Series No. 37, 1975. 30 p. 4 fig.

Descriptors: *Computer programs, *Oil pollution, *Oil spills, *Canada, *Navigable waters, Water resources, Climatology, *Tidal effects, *Estuaries, Data collections, Models, Feasibility studies, St. Lawrence Seaway.
Identifiers: St. Lawrence Estuary.

The feasibility of an operational model to compute the movement of oil slicks in Canadian navigable waters is demonstrated. Some guidelines for establishing a data bank on the topographies of the water bodies, climatology of the various regions and tidal currents in different locations are developed. Descriptions of the computer programs and the relevant subroutines are included. In view of continuing changes in navigational routes and economically favored terminals, and planning of potential future sites, it is recognized that the data bank would require continual updating and expansion. This, however, is a relatively straight-forward matter and does not require any modifications in the basic operational scheme as described. A complete documentation of the program is presented with a simulation of a hypothetical oil spill in the St. Lawrence estuary. (Sinha - OEIS)
W76-09908

METABOLIC CYCLES FOR TOXIC ELEMENTS IN AQUEOUS SYSTEMS,
Minnesota Univ., St. Paul. Freshwater Biological Research Foundation.
For primary bibliographic entry see Field 5C.
W76-09933

THE DISTRIBUTION OF COLIFOKMS IN FRESH WATER, (IN JAPANESE),
Shimane Univ., Matsue (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5C.
W76-09934

USE OF THE PRINCIPLES AND METHODS OF RADIO-ECOLOGY IN SOLVING SOME URGENT PROBLEMS OF MAN'S EFFECT ON THE ENVIRONMENT, (IN RUSSIAN),
For primary bibliographic entry see Field 6G.
W76-09936

ORGANIC SEDIMENT MODEL FOR WASTEWATER OUTFALL,
Tetra Tech, Inc., Lafayette, Calif.
C. W. Chen, D. J. Smith, J. D. Jackson, and J. D. Hendrick.
In: Symposium On Modeling Techniques Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 179-207, 1975. 14 fig, 2 tab, 11 ref.

Descriptors: *Model studies, *Organic wastes, *Sediments, *Outfall sewers, Mathematical models, Waste water(Pollution), Sedimentation, Dispersion, Benthic fauna, Benthos, Biota, Heavy metals, Biochemical oxygen demand, Suspended solids, Bacteria.
Identifiers: *Organic sediments.

In addition to bacterial contamination of beaches, marine wastewater discharges can create environmental problems through accumulation of organic sediments near the outfall. Organic sediment modifies the living environment of benthic animals, causing populations to change, composition to shift, and subtrates to become enriched by heavy metals or other toxic materials. An organic sediment model was developed to follow the processes of sediment accumulation through sedimentation, lateral dispersion, decay, resuspension and dispersion of settling particles of sewage origin. The model was applied to four outfalls under various operating conditions. Available data indicate the veracity of the model. Wider applications of the model, better definition of input data, and capability of the model to consider current characteristics at different strata of water column can improve the results. They in turn can contribute to the goal of designing the outfall system for the protection of indigenous biota. (See also W76-09941) (Sims - ISWS)
W76-09951

PARTICLE-LADEN JETS WITH APPLICATION TO OCEAN DUMPING,
Delaware Univ., Newark. Dept. of Civil Engineering and Marine Studies.
J. D. Ditmars, and M. J. McCarthy.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 335-351, 1975. 7 fig, 12 ref.

Descriptors: *Model studies, *Jets, *Dispersion, Diffusion, Mathematical models, Hydraulic models, Numerical analysis, Laboratory tests, Saline water, Freshwater, Waste disposal, Hydraulics.
Identifiers: *Particle-laden jets, Particle spreading.

The applicability of single-phase buoyant jet models for the prediction of the gross features of particle-laden jets discharged into coastal waters was considered. Laboratory experiments of a continuous discharge into a stagnant, uniform density receiving water were performed for a saltwater jet and three particle-laden jets, all with the same densimetric Froude number. Measurement of concentration profiles within the four different jets indicated different jet behavior for each case. An analysis of the particle-laden jet using the integral similarity approach was presented for the prediction of jet velocity, particle concentration, and width as a function of distance from the discharge. The effect of the particle slip relative to the fluid motion was included. The experimental results and model predictions were used to evaluate the model and to determine an effective spreading coefficient or turbulent Schmidt number for particles. The study indicated that the spreading of particles is less than that of momentum for large values of the ratio of particle fall velocity to jet discharge velocity. (See also W76-09941) (Sims-ISWS)
W76-09959

TEMPERATURE PREDICTIONS FOR OFFSHORE POWER PLANTS,
Massachusetts Inst. of Tech., Cambridge. Energy Lab.
E. E. Adams, and D. R. F. Harleman.
In: Symposium on Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 352-367, 1975. 5 fig, 1 tab, 13 ref.

Descriptors: *Heated water, *Powerplants, *Ocean circulation, *Model studies, Nuclear powerplants, Thermal water, *Thermal pollution, Oceans, Coasts, Cooling, Dispersion, Mixing, Circulation, Mathematical models, Currents(Water), Ocean currents.
Identifiers: *Offshore powerplants.

A far field model was developed and applied to the prediction of ocean temperatures caused by the thermal discharges from a proposed offshore

power plant. The model calculated three-dimensional excess temperatures by superimposing the temperature distributions resulting from discrete, vertically-distributed line sources which are treated by the method of moments. Ambient currents which can vary in the vertical direction and in time, surface heat loss, and turbulent diffusion in all directions were considered. The presence and dynamic effect of the near field was handled explicitly by representing dilution and the size and location of the near field mixing zone as a known function of time. The model was compatible with the type and extent of field data most easily collected-namely, time series data from moored current meters and diffusion experiments using dye or drogues. Because numerical integration is only required in the vertical direction and in time, the model should be useful for generating inexpensive transient temperature estimates for extended periods of time or for quickly comparing far field heat transport characteristics at a number of different locations. (See also W76-09941) (Sims-ISWS)
W76-09960

SAMPLING NETWORK DESIGN FOR DISPERSION VERIFICATION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
B. R. Pearce, R. N. DeGuida, G. C. Dandy, and S. F. Moore.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Franciso, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 368-379, 1975. 2 fig, 1 tab, 8 ref.

Descriptors: *Model studies, *Dispersion, *Suspended solids, *Networks, *Sampling, Dredging, Mathematical models, Numerical analysis, Bays, Circulation, Tides, *Network design, Path of pollutant, Massachusetts.
Identifiers: *Dispersion models, *Massachusetts Bay.

Collection of accurate field data is necessary for verification of pollutant dispersion predictions. Due to the complexity of space and time dependent concentrations, and the high costs of obtaining data, there is a need for a quatitative methodology for design of sampling networks. A two-dimensional finite element dispersion model was used in which the circulation pattern inputs can be determined by a compatible circulation model. These models were applied to Massachusetts Bay, where a large-scale dispersion experiment was performed in June 1973. The objective was to simulate a proposed dredging operation of a valuable deposit of sand and gravel. The experiment proved to be very costly, while the results were of marginal value. The objective of the present research was to devise a useful methodology for design of sampling networks for dispersion experiments. The immediate objective was evaluation of Estimation Theory as a candidate technique, as applied to the case study of Massachusetts Bay. (See also W76-09941) (Sims - ISWS)
W76-09961

NEAR-FIELD JET PENETRATION AND RESERVOIR MIXING,
Georgia Inst. of Technology, Atlanta.
For primary bibliographic entry see Field 8C.
W76-09962

PHYSICAL MODEL OF DISCHARGE IN A TWO-LAYER STRATIFIED AMBIENT,
Duke Power Co., Charlotte, N. C.
For primary bibliographic entry see Field 8B.
W76-09963

RESULTS OF SALINITY TESTS ON THE SAN FRANCISCO BAY-DELTA HYDRAULIC MODEL,
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 2L.
W76-09978

HYDRODYNAMIC TRANSPORT PHENOMENA IN ESTUARIES AND COASTAL WATERS: SCOPE OF MATHEMATICAL MODELS,
Waterloopkundig Laboratorium, Delft (Netherlands).
C. B. Vrengdenhil, and J. Voogt.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 690-708, 1975. 1 fig, 26 ref, 2 append.

Descriptors: *Model studies, *Mathematical models, *Estuaries, Coasts, Hydrodynamics, Tidal effects, Flow, Velocity, Water circulation, Salinity, Hydraulics.
Identifiers: *Model techniques.

An analysis was given of the assumptions in different types of mathematical models for the transport of water and other quantities in estuaries and coastal waters. The starting-point was formed by the equations for three-dimensional turbulent flow. An estimate of the importance of various terms was given. By several averaging processes, increasingly simpler models were obtained, but the interpretation of coefficients became increasingly more difficult. Also the numerical possibilities were discussed, with special emphasis on aspects of accuracy and non-linear stability which are considered the most important numerical problems. Attention was limited to nearly horizontal flow, although the influence of short waves on these flows was also treated. (See also W76-09941) (Sims - ISWS)
W76-09980

APPLICATION OF WATER QUALITY MODELS TO FINGER FILL CANALS,
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
T. O. Barnwell,Jr., and T. R. Cavinder.
In:Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 709-728, 1975. 7 fig, 1 tab, 7 ref.

Descriptors: *Model studies, *Mathematical models, *Canals, *Florida, Water circulation, Water quality, Dye releases, Computer models, Sedimentation, Suspended solids, Biological properties, Water chemistry, Simulation analysis, Dispersion, Hydrology.
Identifiers: *Finger fill canals.

To assess the impact of finger fill canal developments on water quality, EPA Region IV conducted studies on several Lower Florida Canal systems. An attempt was made to model dye studies in the canals using the Receiving Waters Block of the Storm Water Management Model (SWMM). SWMM did not accurately reproduce dye profiles but a different version of the model, the Columbia River Model, did. SWMM's failure lies in omission of dispersion in the mass transport expression. Dispersion appears to be the major transport mechanism in finger fill canals. (See also W76-09941) (Sims-ISWS)
W76-09981

RIVER AND ESTUARY MODELING WITH THE SIVA SYSTEM,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Centre.
For primary bibliographic entry see Field 2A.
W76-09982

HYDRODYNAMIC AND MATERIAL TRANSPORT MODEL FOR MOBILE BAY, ALABAMA,
Alabama University, University. Department of Chemical Engineering.
G. C. April, D. O. Hill, and H-A. Lin.
In: Symposium on Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York p 764-782, 1975. 7 fig, 2 tab, 10 ref. NASA NAS8-29100.

Descriptors: *Model studies, *Mathematical models, *Pollutants, *Water pollution, *Estuaries, *Alabama, Computer models,Streamflow, Rivers, Bays, Coasts, Hydrodynamics, Salinity, Path of pollutants, Coliforms, Water quality, Winds.
Identifiers: *Mobile Bay(Ala).

The purpose of this study were to formulate a hydrodynamic and material transport mathematical model for Mobile Bay and to investigate the influences that river flow rate, wind direction and speed, coliform loading and bay temperature have on bay behavior using the verified models. Results of a detailed parametric study were reported aas tidal cycle average current and salinity profiles, and monthly average coliform profiles. For current and salinity distributions, wind (above 15 knots) effects and river flow rate are significant in shaping the patterns within the bay. Coliform concentration profiles are likewise strongly influenced by river flow rate and water temperature. In all cases, computing efficiency and perceptibility of computer output were of major consideration in the formulation of the Mobile Bay model. (See also W76-09941) (Sims-ISWS)
W76-09983

APPLICATION OF PHYSICAL TIDAL MODELS IN HARBOR AND MARINA DESIGN,
Washington Univ., Seattle. Dept. of Civil Engineering.
R. E. Nece, and E. P. Richey.
In: Symposium on Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 783-801, 1975. 16 fig, 7 ref.

Descriptors: *Model studies, *Marinas, *Harbors, *Washington, Hydraulic models, Pollutants, Water quality, Tidal effects, Tidal waters, Mixing, Dispersion, Water circulation, Water pollution, Estuaries.
Identifiers: *Tidal flushing, *Puget Sound(Wash).

Small scale physical models are efficient, economical tools in the evaluation of designs for small harbors and enclosed marinas where quality problems associated with circulation and tidal exchange are important. Techniques used in such small models for determining flushing characteristics and internal circulation patterns of marinas were presented. The utility of various visual methods for information transfer to various agencies involved with the assessment of a project in its early design phases was discussed. Some generalized features relating planform geometry, tidal range, and entrance configurations to flushing and internal mixing characteristics based on model studies of six marinas, existing or proposed, in Puget Sound, Washington were presented. The application of flushing data obtained from physical model studies to predictive water quality models in the evaluation of proposed designs is a desired result of the studies; one such coupling was presented. (See also W76-09941) (Sims-ISWS)
W76-09984

5C. Effects Of Pollution

RE-EVALUATION OF THE EFFECTS OF MAN-MADE MODIFICATIONS ON GORDON CREEK BETWEEN 1887 AND 1973 AND ESPECIALLY AS REGARDS ITS FISH FAUNA,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 4C.
W76-09407

STUDIES OF PHYTOPLANKTON ECOLOGY IN THE BAY OF VALPARAISO: II. PHYTOPLANKTON 1970-1971, (IN SPANISH),
Chile Univ., Vina del Mar. Departamento de Oceanologia.
For primary bibliographic entry see Field 5A.
W76-09408

ECOLOGY OF CHOLERA VIBRIOS, (IN RUSSIAN),
O. V. Baroyan, P. N. Burgasov, I. N. Gailonskaya, and G. M. Medinskii.
Vestn Akad Med Nauk SSSR. 2, p 45-53, 1975.

Descriptors: Ecology, Epidemiology, *Human diseases, *Pathogenic bacteria.
Identifiers: *Cholera vilrios, *Vibrios.

Lack of integrity in studies of epidemiology of (human) cholera is discussed. The pathogen ecology is underestimated. Conditions favoring the survival and maintenance of cholera vibrios in the environment (water basins) are described. Long-term maintenance (40 days-14 mo.) of cholera vibrios in isolated water basins is discussed. Further research of the ecology of cholera is needed.--Copyright 1975, Biological Abstracts, Inc.
W76-09409

CONCENTRATION OF CESIUM-137 IN AQUATIC ORGANISMS, WATER AND BOTTOM DEPOSITS OF WATER BODIES WITH A DIFFERENT MINERAL COMPOSITIONS OF THE WATER, (IN RUSSIAN),
Polyarnyi Nauchno-Issledovatelskii i Proektnyi Institut Morskogo Rynogo Khozyaistva i Okeanografii, Murmansk (USSR).
N. I. Buyanov, and T. M. Antonenko.
Vopr Ikhtiol. 15(1); p 176-179, 1975.

Descriptors: Cesium, Aquatic animals, *Benthos, Fish, *Trophic level, Reservoirs, *Mineralogy, *Fish food organisms, Absorption, Radioisotopes, Sampling.
Identifiers: *Cesium-137.

Specimens of water, bottom deposits, benthos and fishes belonging to several trophic levels were collected from 3 reservoirs having different levels of water mineralization. The concentration of Cs137 due to global atmospheric fallout in fishes was inversely proportional to the mineralization of the water. The concentration of Cs137 in fishes of higher trophic levels was higher than in organisms of the 1st trophic levels. The presence of a direct effect of trophic levels permits indirect demonstration of the predominant role of food in the uptake of radiosotopes into fish.--Copyright 1975, Biological Abstracts, Inc.
W76-09410

ADDITIONAL OBSERVATIONS ON THE EFFECTS OF STRIP MINING ON SMALL-STREAM FISHES IN EAST-CENTRAL KENTUCKY,
Eastern Kentucky Univ., Richmond. Dept. of Biological Sciences.
B. A. Branson, and D. L. Batch.
Transactions of Kentucky Academy of Science, Vol. 35, No. 3-4, p 81-82, December 1974, 2 tab, 1 fig, 1 ref.

Descriptors: *Strip mines, *Appalachian Mountain region, *Sedimentation, *Fish reproduction, Fish food organisms, Streams, Silting, Turbidity, Fish eggs, Minnows, Darters, Kentucky.
Identifiers: *Kentucky River(Kent).

Continued siltation from strip mine operations in two streams tributary to the North Fork of the Kentucky River has prevented the recovery of fish populations in those streams. All species reported from Leatherwood Creek in 1972 have been forced downstream, and six of those species are now absent from that stream. Two other species are now missing from both streams. Populations of Semotilus atromaculatus apparently are on the increase, perhaps because of the removal of competing species. (Curtis-Forest Service)
W76-09468

POWER GENERATION IN ARIZONA AND ITS ENVIRONMENTAL IMPLICATIONS,
Arizona Univ., Tucson. College of Engineering, Engineering Experiment Station.
For primary bibliographic entry see Field 6D.
W76-09485

REDOX POTENTIAL IN IRRIGATED DESERT SOILS AS AN INDICATOR OF AERATION STATUS,
Imperial Valley Conservation Research Center, Brawley, California.
For primary bibliographic entry see Field 2G.
W76-09488

COMBINED EFFECTS OF RADIOACTIVE, CHEMICAL AND THERMAL RELEASES TO THE ENVIRONMENT,
International Atomic Energy Agency, Vienna (Austria).
Available from UNIPUB, Box 433, Murray Hill Station, New York, N.Y. 10016. Proceedings of a symposium held in Stockholm, June 2-5, 1975. STI/PUB/404, 358 p.

Descriptors: *Environmental effects, *Conferences, *Radiation, *Thermal pollution, Chemical wastes, Effluents, Radioisotopes, Absorption, Radioactivity effects.
Identifiers: Synergism, *Combined effects(Pollutants).

The symposium was sponsored by the International Atomic Energy Agency in cooperation with the OECD Nuclear Energy Agency. The proceedings contains a total of 22 papers from 9 countries and one international organization. A panel discussion is included that examined a number of important questions concerning the combined effects of releases to the environment from the nuclear and other industries. Topics covered in the seven sessions included: effects of temperature on radionuclide uptake, synergism and combination effects in aquatic systems, effects of chemical releases on radionuclide uptake, synergism and combination effects from releases to the atmosphere, and other factors in the assessment of synergistic and combination effects. (See W76-09491 thru W76-09509) (Chilton-ORNL)
W76-09490

INTERACTION MECHANISMS OF RADIOACTIVE, CHEMICAL AND THERMAL RELEASES FROM THE NUCLEAR INDUSTRY, METHODOLOGY FOR CONSIDERING COOPERATIVE EFFECTS,
Institut fur Medizinische Strahlenphysik und Strahlenbiologie, Klinikum Universitats, Essen, Federal Republic of Germany.
C. Streffer.
In: Combined effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a Symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/22. p 3-13, 1 fig, 34 ref.

Descriptors: *Environmental effects, *Radioactivity effects, *Thermal effects, *Chemicals, Radiosensitivity, Methodology.
Identifiers: Synergism.

Data is reported for radiosensitizing agents. The action of radiation on the biological functions and metabolism of DNA are discussed and it is indicated that part of the radiation effects in DNA can be repaired and that living cells can recover from radiation damage. The reactions of a group of radiosensitizers which interacts with DNA or the DNP-complex to change the configurational structure or metabolism is discussed. Antibiotics such as actinomycin D, SH-blocking agents have effect in these interactions. The electron affinic chemicals such as nitro-compounds, ketones, etc. are identified as a second group of radiosensitizers. The problem of possible synergistic effects arising from the chemicals and radiation from the nuclear industry is considered. (See also W76-09490) (Chilton-ORNL)
W76-09491

IMPACT OF THERMAL AND RADIOACTIVE EFFLUENTS ON A TROPICAL NEARSHORE ECOSYSTEM,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
B. Patel, M. C. Balani, S. Patel, V. K. Soman, and S. D. Soman.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a Symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/2. p 17-34, 5 tab, 5 fig, 32 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Radioactivity, Oysters, Clams, Aquatic environment, Ecosystems, Populations, Water pollution effects.
Identifiers: Synergism, India.

Possible effects are discussed of elevated temperatures on the bioaccumulation of a few fission- and corrosion-product radionuclides and the possible synergistic effects of the chemical on certain lamellibranchs. Populations of oysters, ark-shell blood clams and the venerid clam were transported to a discharge canal for field studies. Analysis of gamma spectra of these populations showed photopeaks which were identified as being due to Cs 137, Co 58, 60, and I 131. The oyster populatiom also showed a photopeak which was identified as being due to Zn 65. The impact of temperature on filtration rate was studied with blood clams in the laboratory. The filtration rates increased with increasing temperature from 21 to 30 degrees C. With further rise in temperature, the rates declined slightly, eventually remaining more or less constant between the range of 31 to 35 degrees C. The effect of 2 ppm of chromium after 24 hours acclimation at various temperatures was a depressing one and the depressing effect increased with temperature from 21 to 28 degrees C. (See also W76-09490) (Chilton-ORNL)
W76-09492

THE EFFECT OF TEMPERATURE ON THE UPTAKE AND RETENTION OF CO 60 AND ZN 65 BY THE COMMON SHRIMP CRANGON CRANGON (L),
Reactor Centrum Nederland, Petten, N. H., THe Netherlands.
A. W. van Weers.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a Symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/10. p 35-49, 3 tab, 8 fig, 14 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Radioisotopes, *Shrimp, Cobalt, Zinc, Food, Retention, Temperature, Water pollution effects, Absorption.

The mean concentration factor of Zn65 in whole shrimps after 16-21 days of the uptake experiments ranged from 30-60 and of Co60 from 6-10. The loss of Co60 and Zn65 observed at moulting indicates that adsorption to the exoskeleton plays an important role in the accumulation. Both moulting frequency and rate of food uptake are seen to increase with temperature. Reduction of the biological half-lives of Co60 and Zn65 by a factor of about two for an increase of 10 degrees C in temperature was observed. Temperature increase will result in an increased food uptake and therefore, an increased growth rate. Because of the resulting increase of the rate of turnover of the radionuclides, equilibrium between the concentrations in shrimps and those in the food organisms will be reached more quickly. (See also W76-09490) (Chilton-ORNL)
W76-09493

INFLUENCE DE LA TEMPERATURE SUR LA CONTAMINATION D'ESPECES MARINES PAR LE FER-59, (INFLUENCE OF TEMPERATURE ON THE CONTAMINATION OF MARINE SPECIES BY IRON-59),
Laboratoire de radioecologie marine, Centre de La Hague, Cherbourg, France, Departement de protection.
A. Fraizier, and J. Ancellin.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a Symposium held in Stockhom, June 2-5, 1975. IAEA-SM-197/15. p 51-66, 2 tab, 6 fig, 23 ref.

Descriptors: *Environmental effects, *Temperature, *Radioisotopes, Iron, Fish, *Mollusks, Water pollution effects, Thermal pollution.
Identifiers: *Iron-59.

The marine mollusc, Mytilus edulis, and the fish, Blennius pholis, were used to study their interactions with Fe 59. Emphasis was placed on the physiochemical states of the radionuclide and temperature. Contamination appears to be dependent on temperature and this factor partly influences the physiochemical state of the radionuclide and the metabolic activity of the species. (See also W76-09490) (Chilton-ORNL)
W76-09494

SWEDISH STUDIES ON COMBINATION EFFECTS OF THERMAL DISCHARGES IN THE AQUATIC ENVIRONMENT, SOME ASPECTS OF POWER PLANT SITING POLICY,
Swedish Environment Protection Board, Stockholm, Sweden.
U. Grimas, and U. Ehlin.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a Symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/24, p 69-81, 6 fig, 1 tab.

Descriptors: *Environmental effects, *Water quality, *Thermal pollution, Heat, Oxygen, Cooling water, Water pollution effects, Organic matter.
Identifiers: Negative effects, Mineralization.

Transport mechanisms which involve the direct use of the energy of cooling water discharges are discussed. Speeding up the mineralization of organic matter by addition of heat and oxygen is expected to result in an improvement of water quality. Three examples are discussed where cooling water discharges in polluted areas appear to end up in producing negative effects-a discharge in the innermost part of a long series of semi-enclosed basins, in the mouth of a large estuarine basin, and due to combination effects with toxic metals such as mercury. In choosing between possible sites, areas have to be identified where the available energy of the discharge can be used to improve water quality rather than be lost to the environment. (See also W76-09490) (Chilton-ORNL)
W76-09495

EVALUATION OF THE THERMAL EFFECTS OF A NUCLEAR POWER PLANT,
Ente Nazionale per l'Energia Elettrica, Rome, Italy.
E. Ioannilli, and E. Smedile.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. LAEA-SM-197/5, p 83-94, 4 fig, 2 ref.

Descriptors: *Environmental effects, *Thermal pollution, Model studies, Assessments, Environmental control, Nuclear powerplants, Water pollution effects.

The approach to environmental problems as applied to the coarse Nuclear Power Plant includes the prediction and assessment of power plant impact. The predictive studies involve laboratory work, model research and experimentation on an existing plant located on a site biologically similar to the proposed site. The studies are intended to permit the preparation of a predictive model to be applied to the proposed and future plants. Detailed assessment of the biological resources and chemical parameters in the preoperational phase will be compared statistically with new assessment during operation. (See also W76-09490) (Chilton - ORNL)
W76-09496

BIOLOGICAL EFFECTS OF SIMULATED DISCHARGE PLUME ENTRAINMENT AT INDIANPOINT NUCLEAR POWER STATION, HUDSON RIVER ESTUARY, USA,
New York Univ., Medical Center, N. Y. Inst. of Environmental Medicine.
G. R. Lanza, G. J. Lauer, T. C. Ginn, P. C. Storm, and I. Zubarik.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. LAEA-SM-197/25. p 95-126, 16 tab, 8 fig, 9 ref, 1 append.

Descriptors: *Environmental effects, *Thermal pollution, *Chlorination, *Phytoplankton, Copepods, Juvenile fish, Model studies, *Hudson River, New York, Water pollution effects.

Experiments carried out to examine the effects of simulated plume entrainment upon phytoplankton assemblages showed in one case that the majority of phytoplankton assemblages displayed no measurable effects on photsynthetic activity or chlorophyll a content while another occasion at different ambient temperature resulted in decreased photosynthetic activity. There were no statistically significant differences between survival of ambient exposure groups of copepods and test groups exposed to simulated plume temperatures. Test copepods exposed to chlorinated samples displayed low survival rates. The amphipod, Gammarus spp. did not appear to suffer significant mortality during simulated entrainment. Juvenile striped bass were not affected by simulated plume transit. (See also W76-09490) (Chilton-ORNL)
W76-09497

EFFECT OF ENTRAINMENT IN POWER STATION COOLING SYSTEMS STUDIED USING PERIPHYTIC COMMUNITIES,
Ente Nazionale per l'Energia Elettrica, Rome, Italy.
E. Smedile, and V. Parisi.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. LAEA-SM-197/6. p 127-142, 4 tab, 7 fig, 14 ref.

Descriptors: *Environmental effects, *Thermal pollution, Biota, Seston, *Entrainment, Water pollution effects, *Periphyton.
Identifiers: Colonization.

The studies were aimed at quantifying the difference in biota composition between the intake and outfall and to evaluate the detrimental effects on the organisms. A particularly dynamic study was a comparison of the ability of suspended organisms in the river water ahead of the plant and in the discharge canal to colonize immersed substrates. From a comparison of the patterns of colonization it was possible to hypothesize that the functional capacity of the tygmophil organisms of the bioseston is not affected by passage through the condensers. The data demonstrated how a temperature rise modifies the characteristics of a periphytic community and the dynamics of colonization of immersed substrata. (See also W76-09490) (Chilton-ORNL)
W76-09498

POSSIBLE FUTURE EFFECTS ON THE POPULATION OF THE FEDERAL REPUBLIC OF GERMANY OF GASEOUS RADIOACTIVE EFFLUENTS FROM NUCLEAR FACILITIES,
Kernforschungsanlage Julich, Aachen, Federal Republic of Germany.
For primary bibliographic entry see Field 5A.
W76-09499

SYNERGISTIC EFFECTS OF ATMOSPHERIC RELEASES OF RADIOACTIVE GASES AND SO2 IN INDUCING NUCLEATION IN THE ATMOSPHERE,
Bhabha Atomic Research Centre, Bombay (India).
For primary bibliographic entry see Field 5A.
W76-09500

ADVANTAGES OF NUMERICAL ATMOSPHERIC DISPERSION CALCULATIONS FOR ESTIMATING DISPERSAL AND COMBINATION EFFECTS OF STACK RELEASES FROM THE NUCLEAR INDUSTRY,
Technische Universitaet, Hanover (West Germany).
For primary bibliographic entry see Field 5A.
W76-09501

DISCUSSION OF POSSIBLE EFFECTS DUE TO MIXING OF RADIOACTIVE AND THERMAL RELEASES TO THE ATMOSPHERE FROM NUCLEAR POWER PLANTS,
Kernforschungszentrum, Karlsruhe (West Germany).
For primary bibliographic entry see Field 5A.
W76-09502

SYNERGISTIC EFFECTS OF AIRBORNE EMISSIONS FROM NUCLEAR POWER PLANTS,
Motor-Columbus Consulting Engineers Inc., Baden (Switzerland).
For primary bibliographic entry see Field 5A.
W76-09503

CHARACTERISTICS OF COASTAL CIRCULATION AFFECTING THE TRANSPORT AND DISPERSION OF MATERIAL RELEASED FROM THE NUCLEAR INDUSTRY,
Energy and Research and Development Administration, Washington, D. C.
J. O. Blanton.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/21, p 255-268, 7 fig, 20 ref.

Descriptors: *Environmental effects, Pollution, Coasts, *Water circulation, Winds, *Dispersion, Nuclear powerplants, Currents(Water), Thermocline, Path of pollutants, *Lake Ontario, Lakes.

Future increase in the number of nuclear power plants and associated industry necessitates an ob-

jective assessment of the capacity of the coastal water to transport and disperse the wastes from the nuclear industry that are ejected nearshore. These studies represent an attempt to obtain the spatial and tempral resolution necessary to describe circulation in the coastal zone. Data taken during thermally stratified conditions in Lake Ontario indicate the existence of a zone extending 8 to 10 km from the shore where upwelling and downwelling of the thermocline is confined. The root-mean-square (rms) speeds of the currents are a small fraction of the along-shore velocity component in this zone. Beyond this zone the rms speeds dominate the flow regime and are 2 to 10 times the mean velocity. An important characteristic of dispersion and transport of suspended matter is the large time lag of as much as three days seen in current reversals across the coastal zone which result in episodes of large lateral shear. High shear values do not coincide with high winds but are related to the inability of the nearshore currents to adjust to a slowly varying wind regime. The time for adjustment decreases as water depth nearshore decreases. (See also W76-09490) (Chilton-ORNL)
W76-09504

A SITE STUDY OF THE MULTIPLE EFFECTS OF THERMAL RELEASES ON THE AQUATIC LIFE IN AN ESTUARINE AREA,
Ente Nazionale per l'Energia Elettrica, Milan (Italy).
D. Borgese, G. Dinelli, L. Guzzi, and E. Smedile.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/27. p 269-284, 1 tab, 4 fig, 10 ref.

Descriptors: *Environmental effects, *Model studies, *Thermal pollution, Aquatic life, *Estuaries, Heat, Chlorine, Oxygen, Salinity, Water pollution effects.
Identifiers: Synergism, *Po River Delta(Italy).

A detailed research program on the Po River Delta was established to study the structure of the plant and animal populations, primary production and bacterial activity, physical and chemical characteristics of estuarine waters, coastal characterization, and thermal effects on the biocenosis entering condensers of existing plants. The synergistic effects of heat, chlorine, oxygen and salinity stresses will be established. The data will be used to develop cause-and-effect modelling techniques for relating the local effects of a thermal discharge to their regional consequences. The formulation of predictive impact models will be validated by experiments to provide empirical corrections as required. (See also W76-09490) (Chilton-ORNL)
W76-09505

COST EFFECTIVENESS OF RELEASE PREVENTION CONTROLS FOR TRITIUM AND KRYPTON-85,
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5G.
W76-09506

THE EFFECT OF TEMPERATURE ON THE BEHAVIOR OF MARINE FISHES, A COMPARISON AMONG ATLANTIC MACKEREL, SCOMBER SCOMBRUS, BLUEFISH, POMATOMUS SALTATRIX, AND TAUTOG, TAUTOGA ONITIS,
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Lab.
B. L. Olla, A. L. Studholme, A. J. Bejda, C. Samet, and A. D. Martin.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/4. p 299-308, 4 fig, 1 tab, 13 ref.

Descriptors: *Environmental effects, *Thermal pollution, Temperature, Fish, Fish behavior, Water pollution effects.
Identifiers: *Bluefish, *Atlantic Mackerel, *Tautog.

The comparisons of behavioural responses of the fish to temperature were conducted under controlled laboratory conditions. Under changed temperature conditions, either elevated or lowered, the juvenile and adult bluefish and the adult Atlantic mackeral increased their swimming speeds by 61-190%. This was interpreted as behavioural avoidance to a particular level of temperature and indicated an ability for directive movements in relation to ambient temperature. In contrast to these pelagic species, the tautog, a demersal species which is tied to a particular locus for part of its life and which lives in close association with objects providing cover, was limited in its ability to respond to stress by moving away. Thermal stress caused tautogs to reduce their activity and to exhibit an increased association with cover in the young. Adults did not increase their association with cover. (See also W76-09490) (Chilton-ORNL)
W76-09507

CYCLING OF FE55 AND ZN65 IN COLUMBIA RIVER CARP FOLLOWING REACTOR SHUTDOWN,
Oregon Coll. of Education, Monmouth.
W. M. Jones, C. D. Jennings, and N. H. Cutshall.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/19. p 309-318, 5 fig, 1 tab, 13 ref. AT(45-1)2231, AT(45-1)2227.

Descriptors: *Environmental effects, *Radioactivity effects, Radioisotopes, Model studies, Carp, Iron, Zinc, *Columbia River.
Identifiers: *Fe-55, *Zn-65.

Declines of Fe55 and Zn65 were observed in the tissues of carp following shutdown of the plutonium production reactor at Hanford, Washington. A model for decrease in specific activity was tested for carp flesh and it was found that the loss of Fe55 from carp hearts was faster than the other tissues while the loss rate of Zn65 from hearts appeared to be slowest. The following decreasing order of loss rates of Fe55 from one tissue to another is suggested: heart, eggs, flesh, liver. Zn65 showed no statistically significant difference in loss rates between tissues but the following decreasing trend was suggested: skin, flesh, eggs-liver, heart. The ability of an organism to free itself of radionuclide contamination will depend on what portion of the organism is contaminated and what radionuclide is involved. (See also W76-09490) (Chilton-ORNL)
W76-09508

EFFECTO DE LA TEMPERATURA DE ACLIMATACION SOBRE LA PROLIFERACION DE PRECURSORES ERITROPOYETICOS EN CARASSIUS AURATUS, (THE EFFECT OF ACCLIMATION TEMPERATURE ON PROLIFERATION OF ERYTHROPOIETIC PRECURSORS IN CARRASSIUS AURATUS AND ON THE UPTAKE OF TRITIATED THYMIDINE IN HAEMATOPOIETIC AND INTESTINAL TISSUE),
Junta Energia Nuclear, Madrid (Spain). Division of Quimica.
M. N. Garcia, M. J. B. Pere, and J. G. M. Fernandez.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/9. p 319-327, 4 tab, 3 fig, 6 ref.

Descriptors: *Environmental effects, *Thermal pollution, Fish, Temperature, *Cytological studies, Water pollution effects.
Identifiers: Acclimation temperature, *Goldfish.

Cellular proliferation of undifferentiated erythropoietic precursors in the goldfish acclimated at 5, 10, 20, 30, and 35 degrees C were studied. The duration of cellular cycle from the decrease in the number of grains per nucleus with time were investigated using high resolution autoradiography and DNA labeling. For high acclimation temperatures, an increase in the labelled cell fraction and in the number of grains per nucleus were observed with a shortening of the nitotic cycle. Uptake of tritiated thymidine in intestinal and haematopoietic tissue showed an increased uptake in the haematopoietic tissue with increased temperature and a decrease in uptake by intestinal tissue between 20 and 25 degrees C. (See also W76-09490) (Chilton-ORNL)
W76-09509

SURVEYS ON RADIATION-RESISTANT ASPOROGENIC BACTERIA IN NATURAL ENVIRONMENTS,
Tokyo Univ. (Japan). Lab. of Radiation Genetics.
K. Yano, B. Cho, T. Yoshinaka, and H. Yamaguchi.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/202. p 85-98, 6 fig, 2 tab, 28 ref.

Descriptors: *Radioecology, *Radiation, *Bacteria, Resistance, Environment, Environmental effects, *Surveys, Water pollution effects, Path of pollutants, *Pollutant identification, Sampling.

More than 200 samples were tested including rice grains, faeces of various kinds, and water, mud and soil from areas that were both specific or non-specific for natural or artificial radiation. Highly and extremely radioresistant bacteria which retain only a vegetative form in life had been accidentally discovered after radiosterilization of foods. It was demonstrated that the survey of soil for asporogenic radioresistants was not successful. The results from an aqueous environment were more fruitful with five strains being isolated from a radioactive spring at Misasa. The case of rice grains was particularly noteworthy in connection with the possible presence of a plant symbiont. No radioresistant was discovered in the faeces of animals. The direct function of pigment as a protective agent for ionizing radiation has not been proven but it was noted that all the radioresistants so far isolated produced reddish pigment(s). (See also W76-09512) (Chilton-ORNL)
W76-09519

BIOLOGICAL EFFECTS OF HIGH-ENERGY ELECTRON IRRADIATION OF MUNICIPAL SLUDGE,
Massachusetts Inst. of Tech. Cambridge.
A. J. Sinskey, D. Shah, K. A. Wright, E. W. Merrill, and S. Sommer.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/302. p 139-149, 7 fig, 17 ref.

Descriptors: *Sewage treatment, *Sludge treatment, *Irradiation, Municipal wastes, Disinfection.
Identifiers: High energy electron irradiation, High Voltage Research Laboratory, Electron accelerator.

Preliminary results are presented on the biological effectiveness of high-energy electron treatment of municipal sludge. Positive conclusions include the requirement for blending of raw sludge for maximum effectiveness of the electron beam. Introduction of oxygen in raw sludge leads to increased microbial inactivation. The use of intermittent oxygenation permitted a lowering of the treatment dose. The irradiations were performed at the High Voltage Research Laboratory using a compressed gas-insulated 4-MeV Van de Graaff

electron accelerator, which was operated on simulated or actual sewage at 3 MV for most of the studies. The selection of doses depended on the sensitivity of the organisms and effects under study. (See also W76-09512) (Chilton-ORNL)
W76-09522

SANITARY EFFECT OF GAMMA IRRADIATION ON SEWAGE SLUDGE,
Zurich Univ. (Switzerland). Veterinary Bacteriological Inst.
For primary bibliographic entry see Field 5D.
W76-09527

EFFECTS OF GAMMA RADIATION FROM CO60 ON DILUTE AQUEOUS SOLUTIONS OF LINEAR ALKYL SULFONATE SURFACTANTS AND OTHER ORGANIC POLLUTANTS,
Florida Inst. of Tech., Melbourne.
For primary bibliographic entry see Field 5D.
W76-09531

EFFECTS OF GAMMA IRRADIATION ON THE DEGRADATION OF DYES,
Politecnico di Torino (Italy). Instituto di Chimica Industriale.
For primary bibliographic entry see Field 5D.
W76-09532

EXPERIENCE WITH A PILOT PLANT FOR THE IRRADIATION OF SEWAGE SLUDGE, RESULTS ON THE EFFECT OF DIFFERENTLY TREATED SEWAGE SLUDGE ON PLANTS AND SOIL,
Bayerische Landesanstalt fuer Bodenkultur Pflanzenbau und Pflanzenschutz, Munich (West Germany).
For primary bibliographic entry see Field 5D.
W76-09551

HYDROLOGIC AND CHEMICAL ANALYSIS OF THE PRINCIPAL PIEDMONTESE TRIBUTARIES OF LAGO MAGGIORE IN RELATION TO ITS TROPHIC MODIFICATIONS, (IN ITALIAN),
L. Barranti, A. Calderoni, and A. Carollo.
149 p. Edizioni dell'Istituto Italiano di Idrobiologia: Verbania Pallanza, Italy. 1974.

Descriptors: Trophic level, *Chemical analysis, Lakes, Europe, *Pollutant identification, Phytoplankton, Rainfall, Temperature, Tributaries.
Identifiers: Anabaena-Spiroides, Asterionella-formosa, Fragilaria-crotonensis, Human, Hydrologic, *Italy(Lago Maggiore), Lyngbya-limnetica, Melosira-islandica-var-helvetica, Microcystis-aeruginosa, Mougeotia-sp, Oligochaete, Oscillatoria-rubescens, Rhodomonas-lacustris, Rhodomonas-minuta, Scenedesmus-bijugatus, Scenedesmus-quadricauda, Synedra-acus-var-angustissima.

The morphology, rainfall, and temperature ranges of the catchment basin of Lago Maggiore (Italy) in the past and in 1972-1973, were studied. Chemical analyses of water samples from the various tributaries of the lake showed variation due to the influence of natural, human and industrial wastes. Results were applied in studies of water drinkability, irrigation, recreation and fishing. Similar analyses were performed on the lake itself. An examination of seasonal variation in phytoplanktonic life showed an abundance of Oscillatoria rubescens, Melosira islandica var. helvitica, Asterionella formosa, Synedra acus var. angustissima, Fragilaria crotonensis, Rhodomonas minuta, R. lacustris, Microcystis aeruginosa, Mougeotia sp., Lyngbya limnetica, Anabaena spiroides, Scenedesmus quadricauda and S. bijugatus. An inventory of fish and oligochaete populations was also made.--Copyright 1975, Biological Abstracts, Inc.
W76-09576

UPWELLING NEAR SAMALGA PASS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-09585

MYXOBACTERIA OF THE MYXOCOCCUS GROUP AS INDIRECT INDICATORS OF FECAL MATTER IN SURFACE WATER: 1. COMMUNICATION, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W76-09591

STUDIES ON THE METABOLISM OF A SULFUR-OXIDIZING BACTERIUM. VII. PURIFICATION AND CHARACTERIZATION OF SOLUBLE COMPONENTS INDISPENSABLES FOR SULFUR OXIDATION BY THIOBACILLUS THIOOXIDANS,
Nagoya Univ. (Japan). Biological Inst.
S. Takakuwa.
Plant and Cell Physiology, Vol. 16, No. 6, p. 1027-1035, 1975. 4 fig., 3 tab., 20 ref.

Descriptors: *Metabolism, *Sulfur bacteria, *Biochemistry, *Oxidation, Iron, Proteins, Enzyme, Chelation, Heavy metals, Inhibitors.
Identifiers: *Thiobacillus thiooxidans, Flavoproteins, Sulfur oxidation.

To understand the sulfur oxidation mechanism in Thiobacillus thiooxidans, the nature of a collodion membrane-impermeable soluble fraction was studied. This fraction was required for the sulfur-oxidizing system of Thiobacillus. It was resolved into two components by ammonium sulfate fractionation, Amberlite CG-50 and DEAE cellulose column chromatography, and Sephadex gel filtration. Both components were needed for sulfur oxidation. The first component had a molecular weight of 120,000 and was a non-heme iron protein. The absorption maximum of the oxidized form was 410 nm but reduction shifted it to 420 nm. The second component was a new flavoprotein containing non-heme iron. It also showed an absorption change at 410 nm, but there was a shoulder at 485 nm in the oxidized form which disappeared on reduction. Its molecular weight was 23,000 by gel filtration. Metal-chelating agents like EDTA, sodium diethyl dithiocarbamate, and o-phenathroline inhibited the reconstituted system's sulfur-oxidizing activity. Several nucleotides, which are known flavoprotein inhibitors, inhibited the sulfur-oxidizing activity. Removal of iron from soluble fraction components with potassium cyanide or sodium diethyl dithiocarbamale decreased the reconstituted system's sulfur-oxidizing activity. The iron and flavin in the soluble components may play an important role in the elemental iron-oxidizing system of this organism. (Buchanan-Davidson--Wisconsin).
W76-09592

INTERSTITIAL PROTOZOA AND ALGAE OF LOUISIANA SALT MARSHES,
Tulane Univ., New Orleans, La. Newcomb Coll.
P. B. Elliot, and S. S. Bamforth.
Journal of Protozoology, Vol. 22, No. 4, p. 514-519, 1975. 5 fig., 1 tab., 19 ref.

Descriptors: *Bottom sediments, *Salt marshes, *Algae, *Protozoa, *Louisiana, Distribution, Mud, Oxidation-reduction potential, Varieties, Anaerobic conditions, Decomposing organic matter, Hydrogen sulfide, Photosynthetic bacteria, Food chains, Migration, Omnivores, Carnivores.

Interstitial ciliate distributions were studied in Louisiana salt marshes, stagnant connecting pools with vegetation dominated by Spartina and Distichlis spicata. The sediments had a rich ciliate fauna and constituted a 'sulfide biome'. The marshes lacked an overlying oxidized zone. Water above the sediment and sediment surfaces formed a redox-potential-discontinuity layer containing oxidized and reducing compounds and Eh values reaching to -350 mV. Oxygen flow into interstices is restricted by small size of silt. Undecomposed organic matter depth depended on frequency of disturbances. The redox-potential-discontinuity layer supported algae using light from above and nutrients from below. Anaerobic decomposition produces reduced low molecular weight compounds; and inorganic endproducts like hydrogen sulfide are oxidized by thiobacteria and photosynthetic bacteria, so there were food chains to support diverse ciliate fauna. Sulfide-tolerant organisms resided in surface sediments. Migrations of Plagiocampa, Metopus, Caenomorpha, Sonderia, and Plagiophyla into sulfide-rich zones were observed. The 200 interstitial ciliate species showed definite stratification. Interstitial habitats favored unicellular organisms with flexible, flattened, or worm-like bodies. Carnivores and omnivorous species of Holosticha, Uroleptus, Blepharisma, and Trachelorophis were restricted to the upper two sediment layers. Small bactivores with rigid pellicles and strong swimming patterns penetrated the compacted layer. (Buchanan-Davidson--Wisconsin)
W76-09593

PHOSPHORUS AND NITROGEN CYCLE ON A TRANSECT IN LAKE ONTARIO DURING THE INTERNATIONAL FIELD YEAR 1972-1973 (IFYGL),
Canada Centre for Inland Waters, Burlington (Ontario). Applied Limnology and Physical Processes Section.
P. Stadelmann, and A. Fraser.
International Association of Great Lakes Research, Proceedings 17th Conference Great Lakes Research, p. 92-108, 1974. 9 fig., 21 ref.

Descriptors: *Cycling nutrients, *Phosphorus, *Nitrogen, *Lake Ontario, *Spatial distribution, *Water temperature, Nitrates, Organic matter, Biomass, Thermocline, Water circulation, Stratification, Turnovers, Epilimnion, Primary productivity, Sedimentation, Path of pollutants.

Horizontal and vertical orthophosphate and nitrate distributions and their conversion to organic matter using particulate phosphorus and organic nitrogen as biomass indicators were studied in Lake Ontario samples from a transect at 78 deg W longitude during circulation, thermal bar development, summer stratification, and beginning of fall overturn. Maximum particulate organic nitrogen was 230, particulate phosphorus 20, and chlorophyll 17 micrograms/liter at 10 m in July. Phosphorus and nitrate concentrations decreased when changing from deep circulation to stratification. Recycling of nutrients in the epilimnion was about 81% of the primary production rate expressed as nitrogen uptake rate and 93% when expressed as phosphorus uptake rate; when loading data were included, percentages were reduced to 69% and 87% of the nitrogen and phosphorus uptake rates, respectively. During summer stratification sedimentation from the epilimnion was approximately 0.14 g phosphorus and 3.3 g nitrogen/sq m. During fall overturn, mixing caused total nitrogen and phosphorus concentrations to return to approximately spring circulation values. Nutrient and biomass indicators were identified in both horizontal and vertical dimensions. Midlake epilimnion biomass production depended primarily on nutrient regeneration. The results are limited to a specific transect of the lake. (Buchanan-Davidson--Wisconsin).
W76-09594

AN ASSESSMENT OF POSSIBLE POLLUTION EFFECTS OVER A CENTURY OF THE BENTHIC MARINE ALGAE OF CO. DURHAM, ENGLAND,
Durham Univ. (England). Dept. of Botany.
P. Edwards.

Botanical Journal of the Linnean Society, Vol. 70, No. 4, p. 269-305, 1975. 1 fig., 86 ref.

Descriptors: *Water pollution effects, *Benthic flora, *Marine algae, Phaeophyta, Shores, On-site data collections, Phodophyta, Chrysophyta, Biological communities, Varieties, Europe, Chlorophyta.
Identifiers: England, County Durham(England).

One of the most polluted British shores is in County Durham, England. Pollution effects could be studied there, because extensive herbarium algal collections were made from 1793-1864 before pollution increased dramatically. This list was revised according to modern algal systematics and surviving herbarium specimens examined. There were 145 species, although 8 were excluded because they may not have been collected in Durham and 3 because they were incorrectly identified. These were compared with the present flora of 122 species collected. A detailed list of species is presented, showing their vertical and seasonal abundance, reproduction, characteristics, and collection dates. Eighty-six species were common to both lists. Approximately 48 species were common in the earlier study and 53 now (excluding estuarine algae). The figures indicate there has been little or no reduction in common species with time and pollution. Of the 48 species found earlier, six are now absent and two rare; therefore there has only been a 16.6% reduction in common species over the past century despite increases in industrialization and urbanization. It is concluded that pollution has had only a minimal effect on species diversity on the open Durham County coast where there is good water circulation. (Buchanan-Davidson--Wisconsin)
W76-09595

PHYTOPLANKTON OF THE SALINE WATERS OF KANEM (CHAD): X. CONCLUSIONS, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Dept. of Hydrobiology.
For primary bibliographic entry see Field 2H.
W76-09596

UNDERWATER OBSERVATIONS OF GELATINOUS ZOOPLANKTON: SAMPLING PROBLEMS, FEEDING BIOLOGY, LAND BEHAVIOR,
California Univ., Davis. Dept. of Zoology.
W. M. Hamner, L. P. Madin, A. L. Alldredge, R. W. Gilmer, and P. P. Hamner.
Limnology and Oceanography, Vol. 20, No. 6, p. 907-917, 1975. 51 ref.

Descriptors: *Zooplankton, *Marine animals, *Sampling, *Animal behavior, Food habits, Food chains, Scuba diving, Tropical regions, Oceans, Predation, Jelly fish, Larvae.
Identifiers: *Gelatinous zooplankton, Hydromedusae, Siphonophora, Scyphomedusae, Ctenophora, Heterpoda, Pteropoda, Thaliceae, Appendicularia.

The avoidance behavior, feeding, and predation of the Hydromedusae, Siphonophora, Scyphomedusae, Ctenophora, Heteropoda, Pterpoda, Thalicea, Appendicularia and many meroplanktonic larve were observed (and samples collected) by SCUBA divers. Conventional plankton collection is not likely to sample these organisms accurately because of their fragility, patchy distribution, and escape responses. These relatively large organisms represent several phyla and span two or three trophic levels, but are considered an ecological group on the basis of the predator-protection strategies which they have in common. Many gelatinous plankters filter feed using mucuous structures and are efficient in collecting particulate material, and because mucus is a source of organic aggregates in the sea, their importance has been underestimated. These aggregates are often large, irregularly distributed, of complex composition, and contribute considerable spatial heterogeneity to a seemingly homogenous environment. An entire category of pelagic animals live in association with these floating substrates. Many organic aggregates (marine snow) appear to originate from the mucous secretion of gelatinous zooplankton but their fragility hampers accurate sampling by netting or from the surface. Underwater observations indicated that many 'planktonic' organisms depend heavily on the presence of discrete surfaces, both living and nonliving, in the pelagic environment. (Auen-Wisconsin)
W76-09598

METHODS FOR MEASUREMENT OF BIODEGRADABILITY OF CHEMICAL COMPOUNDS,
Akzo Research Lab., Arnhem (Netherlands).
J. Blok.
International Biodeterioration Bulletin, Vol. 11, No. 3, p. 78-84, 1975. 17 ref.

Descriptors: *Analytical techniques, *Measurement, *Biodegradation, *Chemicals, Activated sludge, Standards, Laboratory tests, Water analysis, Adaptation, Toxicity, Limiting factors, Biomass, Sampling, Degradation(Decomposition).

Standardization of methods for determining biodegradability is needed. Primary biodegradation is detected by specific analysis of the original molecule; environmentally acceptable degradation means that degradation products will cause no further damage or inconvenience to the environment; and ultimate degradation is complete conversion to carbon dioxide, water, and inorganic salts. Biodegradation tests should be designed so that natural or practical conditions are imitated and possible. Biodegradation occurs in water, soil, anaerobic environments, and plants-sunlight. Each major problem--adaptation, toxicity, non-biotic elimination, and analytical limitations--is discussed and recommendations made. Methods for measuring biodegradation are classified on the basis of microbiological criteria: the test substance and biomass concentrations, whether the test substance was the only carbon source, and length of adaptation period. Test methods should be done in environments that provide for adaptation so that the degradation potential will be similar to that of purification plants, fresh surface water, and soil. Besides differences in biodegradation potentials, there is no sharp separation between primary and ultimate degradation. Tests are divided into inoculated die-away and activated sludge tests; the latter came nearest to an ideal situation. Inoculated die-away tests are suitable for measuring ultimate degradation and specific analyses but are not suitable for adaptation tests. (Buchanan-Davidson--Wisconsin)
W76-09599

ON LONG-TERM STABILITY OF ZOOPLANKTON COMPOSITION,
Uppsala Univ. (Sweden). Inst. of Limnology.
B. Pejler.
In: Report No. 54, Institute of Freshwater Research, p. 107-117, 1975. 14 tab., 34 ref.

Descriptors: *History, *Zooplankton, *Data collections, *Lakes, Sampling, Plankton nets, Varieties, Oligotrophy, Eutrophication, Bioindicators.
Identifiers: *Sweden.

Data were collected from central Swedish lakes in which relatively comprehensive studies had been made in different decades. The author's records, literature reports, and archived material were used. There were large variations in collection methods, especially net mesh size, sampling frequency and location, and seasons. Species found in each lake, year reported, and frequencies are presented. Some species (Bosima coregoni and Leptodora kindti) were found in all types of lakes studied. Holopedium gibberum, an indicator of oligotrophic conditions, was frequently found before 1921, but has not been found recently. Daphnia cucullata, an indicator of eutrophy, was only found in some lakes after 1921. Bosmina longirostris, Chydorus sphaericus, and Ceriodaphnia also increased with eutrophication. Bosmina coregoni was not present in the six most eutrophic lakes; in one lake it seemed as if it had been replaced by B. longirostris. Species indicating oligotrophy are usually larger than those indicating eutrophy. Dispersal barriers seemed to play an important role for Eudiaptomus and Eurytemora. Lowered water levels caused true limnoplankters to disappear. There was a high degree of similarity in the earlier and present studies, indicating stability of zooplankton composition; most changes appeared to be short-term rather than long-term. (Buchanan-Davidson--Wisconsin)
W76-09600

DEVELOPMENT OF LABORATORY MODEL ECOSYSTEMS AS EARLY WARNING ELEMENTS OF ENVIRONMENTAL POLLUTION,
Illinois Univ. at Urbana-Champaign.
R. L. Metcalf.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A011 851. $3.50 in paper copy, $2.25 in microfiche. Report AMRL-TR-74-125, Paper No.1, December, 1975. 12 p, 25 ref.

Descriptors: *Toxicity, Methodology, Laboratory tests, Laboratory animals, Analytical techniques, *Water analysis, *Bioassays, Biological communities, *Ecosystems, Water pollution effects, *Pesticide residues, *Pesticide removal, *Biodegradation.
Identifiers: Model ecosystems, Bioaccumulation, Degradation products.

Described are the development and use of laboratory model ecosystems to evaluate the toxic effects of pesticides on a large variety of organisms; to study the degradation of pesticides in the environment; to determine the bioaccumulation and biodegradability of pesticides and their degradation products. (Katz)
W76-09643

THE ROLE OF BIOASSAYS IN ENVIRONMENTAL RESEARCH,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 5A.
W76-09644

ECOSYSTEM MODELING,
Utah State Univ., Logan.
W. J. Grenney, and D. B. Porcella.
Available from the National Technical Information Service , Springfield, Va 22161, as AD-A011 852, $4.00 in paper copy, $2.25 in microfiche. Report AMRL-74-125, Paper No. 2, December, 1974. 28 p, 9 fig, 26 ref.

Descriptors: *Water quality, *Ecosystems, Methodology, Analytical techniques, *Biological communities, *Model studies, *Hydrologic models, *Estimating, Synthesis, Testing, Theoretical analysis, Water analysis.
Identifiers: Compartment models, Model limitations, Subcompartment models, Component modeling, Model application.

Ecosystems are systems of living organisms in a physical and chemical environment which have developed and adapted over long periods of time. They present unique problems for quantitative description and prediction. Mathematical models can be used to analyze these systems subject to many limitations. All models are less than perfect and their evaluations should be based on characteristics related to their proposed use. (Katz)
W76-09645

EFFECTS OF DISCHARGE FROM A DREDGE SPOILS SITE ON CARROLL ISLAND, MARYLAND,
Edgewood Arsenal, Aberdeen Proving Ground, Md. Biomedical Lab.
J. G. Pearson, and E. S. Bender.
Available from the National Technical Information Service, Springfield, Va., 22161, as ADA012 206, $3.50 in paper copy, $2.25 in microfiche. Technical Report EB-TR-75030, June, 1975. 21 p., 1 tab., 7 fig., 8 ref.

Descriptors: Benthos, *Maryland, *Estuaries, Ecosystems, Biological communities, *Dredging, *Spoil banks, *Bottom sampling, *Benthic fauna, Clams, Annelids, *Crustacea, Storm runoff, *Tropical cyclones, *Hurricanes, *Chesapeake Bay, Invertebrates, Path of pollutants, Waste disposal.
Identifiers: Carroll Island(Md), Tropical Storm Agnes, Rangia cuneata, Leptocheirus plumulosus, Scolecolepides, Dredge spoils, Dredge spoils runoff.

Benthic sampling of macroinvertebrate populations was conducted 14 times from April to August 1972 to determine the effects of a discharge from a dredge spoils site on Carroll Island, Maryland, on the upper western shore of the Chesapeake Bay. During the sampling period, 8.78 inches of rain fell on the study area from 21 to 23 June 1972 during tropical storm Agnes. Nine samples were collected prior to Agnes and five were taken after the storm. Twenty-two species (20 invertebrates and 2 vertebrates) were collected; 81.5% of the sample was represented by three species: the brackish-water clam, Rangia cuneata; the amphipod, Leptocheirus plumulosus; and the polychaete, Scolecolepides viridis. The number of small R. cuneata (1.3 to 4.3 mm) increased significantly after the storm, indicating that there was an influx of juvenile clams. Despite the extreme temporary hydrologic occurrences caused by the tropical storm, most changes in the number of individuals and species could be attributed to the effects of the dredge spoils discharge on Station 3 and seasonal changes in the species abundance during the study period. In high siltation, L. plumulosus populations declined, whereas S. viridis populations remained relatively constant. Possible exceptions are the freshwater snail, Hydrobia sp., which was found commonly after the storm but was collected only once before the storm; and Corophium lacustre and Edotea triloba, which decreased in abundance after the stom, apparently being washed down estuary. (Katz)
W76-09647

MICROBIAL DEGRADATION OF MODEL PETROLEUM AT LOW TEMPERATURES,
Maryland Univ., College Park. Dept. of Microbiology.
J. D. Walker, and R. R. Colwell.
Available from the National Technical Information Service, Springfield, Va., 22161, as Ada009 558, $4.00 in paper copy, $2.25 in microfiche. Microbial Ecology, Vol. 1, p. 63-95. 1974. 16 fig., 8 tab., 18 ref.

Descriptors: *Oily water, Oil, *Oil spills, *Chesapeake Bay, *Microbial degradation, *Marine bacteria, *Aquatic fungi, *Water temperature, Oil pollution, Oil-water interface, Organic wastes, Inlets(Waterways), Aquatic microbiology, Biological treatment, Microorganisms, Marine fungi, Methodology, Pseudomonas, Water pollution effects.
Identifiers: Petroleum degrading microorganisms, Vibrio aeromonas, Acinetobacter, Hydrocarbons, Alkanes, Baltimore Harbor, Branched alkanes, Cyclic alkanes, Aromatics, Polynuclear aromatics.

Two areas of Chesapeake Bay are presently under study, with routine sampling of water and sediment for petroleum-degrading microorganisms (bacteria, yeasts, and fungi). Selected physical and chemical parameters are recorded for each sampling site, and water and sediment samples are extracted for hydrocarbons. Numbers of petroleum-degrading microorganisms enumerated by direct plating were found to correlate with the concentration of benzene-extractable material and were higher for the Colgate Creek than for the Eastern Bay site. Petroleum-degrading microorganisms were isolated from water and sediment samples at environmental temperatures of 0 degrees, 5 degrees and 10 degrees C. Higher growth yields and maximum hydrocarbon degradation were observed for microorganisms in a salts medium at 0 degree, 5 degree, and 10 degree C, although significant quantities of hydrocarbons were utilized in some samples grown in a medium for which Chesapeake Bay water was the diluet. Bacterial hydrocarbon degradation accounted for most of the model petroleum utilization at 0 degree and 5 degree C. However, oscillations of bacterial populations, with significant growth of yeasts, were observed at 10 degree C. Photomicroscopy and scanning electron microscopy revealed aggregates of bacteria, yeasts, and fungi associated with oil globules. From preliminary identification and classification of the hydrocarbon-utilizing bacteria, members of the genera Vibrio, Aeromonas, Pseudomonas and Acinetobacter were present in the enrichment cultures. From results of this study, it is concluded that utilization of model petroleum at low temperatures is a function of the types and numbers of microorganisms present in an original inoculum taken from the natural environment. (Katz)
W76-09648

PATHOLOGY OF ACUTE POISONING WITH THE INSECTICIDE SEVIN IN THE BENT-NOSED CLAM, MACOMA NASUTA,
Oregon State Univ., Newport. Marine Science Center.
D. A. Armstrong, and R. E. Millemann.
Available from the National Technical Information Service, Springfield, Va., 22161, as COM-75 10546, $3.50 in paper copy, $2.25 in microfiche. Journal of Invertebrate Pathology, Vol. 24, p. 201-212, 1974. 13 fig., 18 ref.

Descriptors: *Toxicity, *Insecticides, *Poisons, *Clams, Mollusks, Shellfish, Histology, Necrosis, Tissues(Biology), Cells(Biology), Animal pathology, *Fish diseases, Water pollution effects.
Identifiers: *Toxicity tests, *Sevin, Bent-nosed clams, Macoma nasuta, Cell damage.

Toxicity tests of 96-hr duration of the insecticide Sevin were done with adult bent-nosed clams, Macoma nasuta. Sevin concentrations of 15, 20, 25, and 30 mg/liter were used in duplicate tests. The criterion of 'death' was the inability of clams to retract siphons or to close valves. About half of the animals so affected were removed from the test solutions and returned to clean sea water to observe if recovery occurred, and others were preserved for histological examination. No 'dead' clams recovered within 96 hr after return to clean water. The histopathology consisted primarily of necrosis of epithelial tissue of the gill, mantle, siphon, and suprabranchial gland, and the severity of damage was directly related to the test concentrations. Vacuolization, rupture, and pycnosis of cells occurred. The gills were the most severely affected organs. Epithelial cells of the gill filaments bearing the frontal, latero-frontal, and lateral cilia were sloughed as early as 24 hr after the beginning of exposure to Sevin. About 50% if the exposed clams had lost one or both siphons and also the epithelia on still attached segments within 96 hr of exposure. There were no deaths of control clams, and their tissues were normal. (Katz)
W76-09649

SPECIES COMPOSITION AND DIVERSITY OF POLYCHAETES IN THE NEW YORK BIGHT,
Pacific Northwest Environmental Research Lab., Newport, Oreg. Marine Science Center.
J. R. Frey.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-241 191, $3.50 in paper copy, $2.25 in microfiche. EPA Report , Septmber, 1973. 17 p. 5 fig., 2 tab., 9 ref.

Descriptors: *Waste disposal, *Benthic fauna, Marine animals, *On-site investigations, *Benthos, Methodology, Annelids, Biota, New York, Atlantic Ocean, Continental shelf, Sea water, *Bioindicators.
Identifiers: *New York Bight, *Polychaetes, Indicator species, Bamboo worms, Maldanidae, Oweniidae, Faunal homogeneity indices.

This study is part of a larger investigation of the biological consequences of waste disposal in the New York Bight. Polychaetes from the samples of three cruises (December, 1972; February and May, 1973) in the Bight were identified. 'Bamboo worms' (families Maldanidae and Oweniidae) were the most abundant and ubiquitous polychaetes and would therefore be the best indicator species to monitor pollution in the area. No temporal changes in the densities of polychaete populations were evident, but summer and fall collections must be analyzed to complete the seasonal distribution. It is suggested that there is an optimal sediment size for polychaetes, above and below which the populations decrease. Faunal homogeneity indices for all pairs of samples were computed and plotted, giving a bimodal distribution. It is likely that the left peak of this graph is due to two aberrant samples, without which the data would be normally distributed. A normal distribution indicates an intergrading of polychaete species rather than the distinct communities indicated by a bimodal distribution. (Katz)
W76-09650

SUBSTITUTE CHEMICAL PROGRAM - INITIAL SCIENTIFIC AND MINIECONOMIC REVIEW OF CAPTAN.
Midwest Research Inst. Kansas City, Mo.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 559, $7.50 in paper copy, $2.25 in microfiche. Report EPA-540/1-75-012, April, 1975. 173 p, 30 tab, 75 ref.

Descriptors: *Toxicity, Fish, Laboratory animals, Domestic animals, *Bioassays, *Pathology, Water quality, *Minnows, *Salmonids, *Pesticides, Agronomic crops, Environmental effects, Physiological effects, Reviews, Economics.
Identifiers: Thalidomide, *Captan, *Histopathological observations, *Captan metabolites, Rabbits, Hamsters, Teratogenic activity, Mutagenic activity, Reconstituted water, EBDC fungicides, Ethylenebisdithiocarbamate, Public Law 93-135.

This is the 5th in a series of in-depth scientific literature searches which review the safety and efficacy of substitute chemicals registered by EPA as possible replacements for cancelled or suspended pesticides or pesticides in litigation. The review covers all uses of captan and is intended to be adaptable to future needs. Should captan be identified as a substitute for a problem pesticide other than ethylenebisdithiocarbamate (EBDC), as is now the case for certain uses of these fungicides, the review can be updated. The data contained in this report was not intended to be complete in all areas. Data-searches ended in January, 1975. (Katz)
W76-09651

ENVIRONMENTAL RESPONSES TO THERMAL DISCHARGES FROM THE CHESTERFIELD STATION, JAMES RIVER, VIRGINIA,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
L. D. Jensen.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 671, $7.50 in paper copy, $2.25 in microfiche. Report

No. 13, December, 1974. 180 p, 50 fig, 50 tab, 195 ref. EPRI Project RP-49.

Descriptors: *Cooling water, Effluents, *Virginia, Plankton, *Phytoplankton, Water quality, *Primary productivity, *Zooplankton, Benthos, Benthic fauna, Animal groupings, Statistical analysis, Water chemistry, Water temperature, Sewage, *Thermal pollution, Water pollution effects, Entrainment, *Dissolved oxygen.
Identifiers: *James River(Va), Diversity Indices, Chesterfield Power Station(Va).

A study was made of the temperature and dissolved oxygen in the James River, Virginia, for more than 25 sampling stations, starting above the city of Richmond and extending to Hopewell. Fisheries data have been collected from the same stations on adult and juvenile fishes of both resident and transient species, and in the vicinity of the Chesterfield power station, on the benthic invertebrates. Planktonic investigations have involved population and diversity studies in the main river and Farrer Gut, and have been augmented by entrainment studies on the effect of passing microscopic organisms through the condenser system of the power station. In conclusion, the James River in the Chesterfield area seems to support a large, diversified population structure in the fisheries aspect. The impact of the city of Richmond appears to be the major factor in determining the nature and health of the fishes in the area; and the operation of the Chesterfield Power Station has a seasonal impact that does not appear to be much more than an alteration of the patterns of normal distribution. There is evidence of spawning, growth and development of many species of fish. (Katz)
W76-09652

A SCREENING BIOASSAY USING DAPHNIA PULEX FOR REFINERY WASTES DISCHARGED INTO FRESHWATER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W76-09653

ENVIRONMENTAL QUALITY RESEARCH, FIRST ANNUAL REPORT,
California Univ., Irvine.
S. Lerman, R. Cooper, J. Scherfig, and G. Greenhouse.
Available from the National Technical Information Service, Springfield, Va., 22161, as AD-A011 558, $4.50 in paper copy, $2.25 in microfiche. Air Force Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio, AMRL-TR-74-82, February, 1975. 54 p, 10 tab., 13 fig., 17 ref.

Descriptors: *Gymnosperms, *Fish, Aquatic life, *Aquatic algae, *Periphyton, *Toxicity, *Bioassay, *Metabolism, *Inhibitors, Frogs, Acids, Laboratory procedures, Chlorophyll, Biomass, Biota, *Environmental effects.
Identifiers: *Aufwuchs, Angiospore, Leopard Frog, South African Clawed Toad, Hydrogen chloride, Hydrogen fluoride, RJ 4, RJ5, JP 4, N phenyl-a-naphthylamine, p,p' dioctyldiphenylamine, Octyl-phenyl-a-napthylamine, Teratogenesis, Ornamental plants.

This report for the period from February 1 to June 15, 1974, contains the results of research efforts of 4 projects concerned with defining the environmental effects of potential environmental contamination resulting from the use of certain Air Force materials. The 4 projects use different organisms as means of assessing effects. Project I uses the higher plants, the gymnosperms and angiosperms. Project II uses fish and aufwuchs. Project III utilizes unicellular algae and Project IV uses the eggs, embryo and larvae of the leopard frog. Materials being evaluated include hydrogen chloride, hydrogen fluoride, RJ 4, RJ 5, JP 4, N phenyl-a-naphthylamie, p,p' dioctyldiphenylamine, octyl-phenyl-a-napthylamine. Techniques for exposing organisms to these substances are discussed and the results of such exposures are presented. (Katz)
W76-09654

PHYSIOLOGIC RESPONSES TO WATER IMMERSION IN MAN: A COMPENDIUM OF RESEARCH,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
For primary bibliographic entry see Field 10C.
W76-09655

THE MICROBIOLOGICAL POLLUTION OF NORTH SEA AND ENGLISH CHANNEL SHORE, (IN FRENCH),
Institut Pasteur, Lille (France). Laboratoire d'Hydrobiologie.
C. Oger, A. Philippo, and H. Leclerc.
Ann Microbiol (Paris). 125B(4), p 513-528, 1974.

Descriptors: Microbiology, Water pollution, Streptococcus, Epidemiology, *Coliforms, Salmonella, Oil pollution, Methodology, Surfactants.
Identifiers: Fecal coliforms, North Sea(France), English Channel(France), Bonde's method.

In summer 1973 the microbiological pollution of the French beaches of the North Sea and the English Channel was studied. Fecal coliforms, fecal streptococci, salmonellae and amounts of surfactants and hydrocarbon matter were measured. Bonde's method was used to interpret the results; the epidemiological consequences of these are discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-09657

GENERATION TIME, LENGTH OF LIFE, INSTAR DURATION AND FREQUENCY OF MOULTING, AND THEIR RELATIONSHIP TO TEMPERATURE IN EIGHT SPECIES OF CLADOCERA FROM THE RIVER THAMES, READING,
Reading Univ. (England). Dept. of Zoology.
H. H. Bottrell.
Oecologia (Berl.), Vol. 19, p 129-140, 1975, 9 tab, 31 ref.

Descriptors: *Environmental effects, *Growth stages, Juvenile growth stage, Mature growth stage, *Crustaceans, *Temperature, Eggs.
Identifiers: *River Thames(England).

Generation time, length of life, instar duration and moulting frequency of 8 species of epiphytic Cladocera were found to be inversely related to temperature. Numbers of juvenile instars varied between species with larger species tending to have more juvenile instars than smaller species. The number remained constant for a particular species. The size relationship was also found to hold for generation time. Except at low temperatures, adult instar duration was the same as egg development duration. Juveniles moulted more often than adults. Regression analysis of the relationships between the various dependent variables and temperature required a logarithmic transformation. (Chilton-ORNL)
W76-09658

THE RELATIONSHIP BETWEEN TEMPERATURE AND DURATION OF EGG DEVELOPMENT IN SOME EPIPHYTIC CLADOCERA AND COPEPODA FROM THE RIVER THAMES, READING, WITH A DISCUSSION OF TEMPERATURE FUNCTIONS,
Reading Univ. (England). Dept. of Zoology.
H. H. Bottrell.
Oecologia (Berl), Vol. 18, p 63-84, 1975, 4 fig, 13 tab, 59 ref.

Descriptors: Environmental effects, *Growth rates, Mathematical models, Growth stages, *Eggs, *Crustaceans, *Copepods, *Temperature.
Identifiers: *River Thames(England).

Duration of egg development at 5, 10, 15, and 20 degrees C for 8 Cladoceran and one cyclopoid copepod was investigated. Development time was inversely related to temperature; decreased temperature caused a marked increase in development time. Cladoceran eggs tended to take longer for development than copepod eggs; epiphytic species took longer than planktonic species, and the eggs of larger species took longer than smaller species. A curvilinear logarithmic model of the relationship between rate of egg development and temperature was found to be a more generally applicable model than a linear model. (Chilton-ORNL)
W76-09659

EFFECTS OF SHOCK TEMPERATURE ON BIOLOGICAL SYSTEMS,
Michigan Technological Univ., Houghton. Dept. of Civil Engineering.
J. L. Carter, and W. F. Barry.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 101, No. EE2,p 229-243, April 1975. 8 fig, 2 tab, 24 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Thermal stress, Bacteria, Chemical oxygen demand, Biochemical oxygen demand, Oxygen, Temperature, Water pollution effects, Activated sludge, Waste water treatment.

The solubility of oxygen and/or the bacterial activity in activated sludge systems may be affected as a result of sudden shifts in temperature. An increase in temperature may result in a lower saturation of oxygen. Reduction of oxygen transfer can result in poor treatment. Bacterial activity may be affected even if sufficient oxygen is present. Experimental data showed that uptake rates/gram of Mixed Liquor Volatile Suspended Solids (MLVSS) were equal at 35 - 50 degrees C but the total amount of oxygen required per gram of MLVSS at 50 degrees C was four times that required at 35 degrees C to achieve removal of soluble COD. The rate of initial soluble COD removal/gm MLVSS was six times greater at 15 degrees C than at 50 degrees C. More solids were produced per gram of soluble COD removed at 35 degrees C than at 50 degrees C. A BOD removal of 95% was achieved at 35 to 50 degrees C. (Chilton-ORNL)
W76-09660

NITROGEN IN THE SUBSURFACE ENVIRONMENT,
East Central Oklahoma State Univ., Ada. School of Environmental Science.
For primary bibliographic entry see Field 5B.
W76-09662

LABORATORY EVALUATION OF THE COULTER ON-LINE PARTICLE MONITOR,
Welsh School of Pharmacy, Cardiff.
For primary bibliographic entry see Field 5A.
W76-09699

ACID-IRON WASTE AS A FACTOR AFFECTING THE DISTRIBUTION AND ABUNDANCE OF ZOOPLANKTON IN THE NEW YORK BIGHT: I. LABORATORY STUDIES ON THE EFFECTS OF ACID WASTE ON COPEPODS,
Harvard Univ., Cambridge, Mass. Biological Labs.
G. D. Grice, P. H. Wiebe, and E. Hoagland.
Estuarine Coastal Mar Sci. 1(1), p 45-50, 1973.

Descriptors: *Industrial wastes, *Acidic water, New York, Iron, *Zooplankton, Copepods, Mortality, Plankton, Toxicity, Sea water.

Identifiers: New York Bight, Calanus-Finmarchicus, PseudocalanuseSp., Temora-Longicornis.

Individuals of Calanus finmarchicus, Temora longicornis and Pseudocalanus sp. were maintained in bottles containing varying dilutions of acid wastes in sea water or control sea water solutions for 24 to 48 h to examine survival of adults exposed to high concentrations of waste. They were also maintained for time periods up to 18 days to ascertain effects on reproduction and survival of young. Individuals of C. finmarchicus were transferred through a series of increasing dilutions of acid wastes and into filtered sea water to simulate the short-term effects of acid waste concentrations in the wake of a discharging barge. Substantial mortality of adults of the above 3 copepods occurred at concentrations of acid waste producing pH of approximately 6.5 and lower. This is not indicative of mortality in the field as these concentrations and pH values exist for only a short time (less than 3 min) due to rapid mixing of the acid waste with sea water. Individuals maintained in buffered acid wastes of comparable dilutions showed no mortality, while individuals maintained in test media using sulfuric acid in place of acid waste showed high mortalities at pH of 5.5 or less. Acidity of test solutions may be a principal cause of copepod mortality rather than some toxic component of the waste material. Inhibition of reproduction and deleterious effects on survival of young were observed in experiments of 18 days duration at concentrations of acid wastes which do not in fact persist for such periods on the acid grounds. No mortality was observed when C. finmarchicus was transferred through acid waste dilutions which with pH values and time periods comparable to those they would encounter on the acid grounds during discharge of acid wastes. Acid waste discharges, were not responsible for the large variations in zooplankton biomass previously observed in the survey area since mortality of species due to short term exposure to high concentrations of waste appears small and little effect on adults or larval forms at great dilutions could be demonstrated.(See also N75-04574) Copyright 1975, Biological Abstracts, Inc.
W76-09700

POLLUTION INFLUENCE ON THE INFUSORIAL FAUNA (PROTOZOA, CILIATA) OF BULGARIAN RIVERS II. THE OGOSTA RIVER AND ITS EFFLUENTS,
For primary bibliographic entry see Field 5A.
W76-09714

MATERIALS BUDGETS OF LAKE CHAMPLAIN,
Vermont Univ., Burlington. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W76-09756

IMPROVING WATER QUALITY BY CONTROL OF ALGAE: CELLULAR AND EXTRACELLULAR BLUE-GREEN ALGAL POLYSACCHARIDES,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5G.
W76-09760

PLANKTON ANALYSIS TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 008, $9.00 in paper copy, $2.25 in microfiche. Report EPA-430/1-75-004, March 1975. 260 p. 402 fig., 15 tab., 317 ref.

Descriptors: *Plankton, *Training, Analytical techniques, Distribution, Laboratory tests, Testing procedures, Cytological studies, Varieties, Sewage bacteria, Sampling, Zooplankton, Cyanophyta, Bioindicators, Chlorophyta, Bacteria, Algal control, Diatoms, Environmental sanitation, Aquatic fungi, Intakes, Protozoa, Judicial decisions, Nematodes, Systematics, Rotifers, Organoleptic properties, Productivity, Growth rates, Actinomycetes, Algae, Water pollution effects, Organic wastes, Nutrients, Limiting factors, Eutrophication, Pollutant identification.
Identifiers: Amoebas, *Training manuals, Plankton identification.

This course is designed for professional personnel in the fields of water pollution control, limnology, and water supply. Topics covered are: Plankton limnology and ecology; biology of zooplankton communities; optics and the microscope; cell structure and function; algal types--blue-green, green, and pigmented flagellates; filamentous and coccoid green algae; diatoms; filamentous bacteria; fungi and 'sewage fungus'; protozoa; nematodes; rotifers; free-living amoebae; and animal plankton. Laboratory methods for diatom and animal plankton identification; preparation and enumeration; fundamentals, calibration, and use of plankton counting equipment; determination of odors and plankton productivity; proportional plankton counting; algal growth potential test; and algae and actinomycetes in water supplies are described. Guidance is given to use of algae as pollution indicators; odor production by algae and other organisms; plankton in oligotrophic lakes; effects of pollution on lakes; application of biological data; problem of synthetic organic wastes; significance of limiting factors for population variation; nutrients; algae and cultural eutrophication; algal control; control of interference organisms in water supplies; and case preparation and courtroom procedures. Keys to selected groups of freshwater animals and algae important in water pollution and a classification-finder are also included. (Buchanan-Davidson--Wisconsin)
W76-09782

IS THE EXAMINATION OF DRINKABLE WATER AND SWIMMING POOLS ON PRESENCE OF ENTEROPATHOGENIC E. COLI NECESSARY, (IN GERMAN),
Mikrobiologie Institut Medical Fakulteti, Ljubljana (Yugoslavia).
A. Z. Dragas, and M. Tratnik.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 160(1), p 60-64, 1975.

Descriptors: Potable water, E. coli, Enteric bacteria, Water analysis, Enteric bacteria, Swimming pools, Human diseases, Public health, Pollutant identification.

The examination of 1950 different water samples showed that 21.5% of them were micro-biologically unsafe and had a high MPN (most probable number) of E. coli; 2.3% of these strains belonged to enteropathogenic groups. The percentage depended on the character of water establishment, and was in small water supplies as high as 8%; in swimming pools, 11%. The following OK groups of enteropathogenic E. coli were identified: O25:K11, O28:K73, O55:K59, O78:K80,O115, O126:K71, O146, all known causes of acute enteric diseases of children and adults. During outbreaks or other epidemiological events, it is useful to examine the E. coli strains isolated from different water samples serologically, in order to eventually identify them as enteropathogenic.--Copyright 1975, Biological Abstracts, Inc.
W76-09785

MARINE SOIL POLLUTION AND SELF-PURIFICATION, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5A.
W76-09789

SEDIMENTATION AND PHOSPHORUS BALANCE IN LAKE LUCERNE (HORW BAY) AND IN THE ROTSEE, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
J. Bloesch.
Schweiz Z Hydrol. 36(1), p 71-186, 1974.

Descriptors: *Lake sediments, Lakes, *Phosphorus, Mesotrophy, Phytoplankton, *Eutrophication, Europe, Chemical analysis, Nutrients, Biomass, Nitrogen, *Cycling nutrients, *Nutrient requirements, Primary productivity.
Identifiers: *Rotsee(Switzerland), *Lake Lucerne(Switzerland).

In 1960/70, chemical and physical parameters, phytoplankton and recent sedimentation at different levels were investigated in the mesotrophic Lake of Lucerne (Horw Bay) and in the highly eutrophic Rotsee (Switzerland). The rates of sedimentation were 1277.4 g dry matter/m2. yr in Horw Bay and 879.3 g dry matter/m2. yr in the Rotsee. The chemical analysis of sediments included the following components: total organic substance (loss on ignition), organic C, clay minerals (HCl-insoluble fraction), Ca, Mg, P, N, Fe and Mn. The Rotsee is distinguished by higher nutrient concentrations, higher rates of sedimentation (exceptions: clay minerals, Fe and, to a certain extent, N and Mn) and by a greater biomass of phytoplankton. The distribution and succession of selected species and groups of phytoplankton are discussed, the velocity of sinking, the degradation, the growth dynamics and the measure of trophic state are calculated. For both sakes, a P and a N balance were drawn up. The N:P ratio continually decreases through the nutrient cycle from the input to storage in the bottom sediments. The intrabiocoenotic P cycle in the epilimnion is very intensive and supplies approximately 2/3 of the nutrient requirements for primary production in both Horw Bay and the Rotsee.--Copyright 1975, Biological Abstracts, Inc.
W76-09790

ROTIFER PRODUCTION IN LAKE BAIKAL, (IN RUSSIAN),
Biologo-Geograficheskii Nauchno-Issledovatelskii Institut, Irkutsk (USSR).
G. L. Vasil'eva, and V. L. Nikulin.
Zool Zh. 53(8), p 1125-1132, 1974.

Descriptors: *Rotifers, Asia, *Biomass, *Plankton, *Production, Littoral, Lakes, Growth rates.
Identifiers: Filinia-Terminalis, Kellicottia-Longispina, Keratella-Cochlearis, Keratella-Quadrata, Notholca-Grandis, Notholca-Intermedia, Synchaeta-Grandis, Synchaeta-Pachypoda, Synchaeta-Stylata, *Lake Baikal(USSR).

Population density, biomass and production were studied in planktonic rotifers of Lake Baikal: Synchaeta pachypoda, S. stylata, S. grandis, Notholca grandis, N. intermedia, Kellicottia longispina, Keratella cochlearis, K. quadrata, Filinia terminalis. Material were collected near the Baikal Biological Station of the Irkutsk State University in the pelagic zone for 1 yr and in the littoral zone for nearly 3 yr. Production was studied by the Edmondson's method (1960). The yearly G/W (growth/weight) coefficient of rotifers-filtrators in the pelagic zone was 45, in the littoral zone-49, that of predators in the pelagic zone-14 and in the littoral zone-13. The average daily G/W coefficient of different species varied from 0.001-0.2 during the year.--Copyright 1975, Biological Abstracts, Inc.
W76-09791

HYGIENIC ASSESSMENT OF CHANGES IN MINERAL WATER PROPERTIES DURING ITS TREATMENT FOR USE IN INTERNAL BAL-

NEOTHERAPEUTIC PROCEDURES, (IN RUSSIAN),
Stavropol Territorial Medical Inst. (USSR).
P. I. Filippov.
Gig Sanit. 38(2), p 95-96, 1973.

Descriptors: *Bacteria, *Mineral water, Thermal water, *Water treatment, *Coliforms, Enteric bacteria, Public health, *Shigella.
Identifiers: *Enterococci, *Proteus, Therapeutic mineral waters, Balneotherapy(Human).

Delivery, conditioning and tapping of nonpotable mineral water intended for internal use in balneological therapy (enema) caused deterioration of the water with regard to bacteriological, chemical, sanitary and therapeutic properties. A low coliform titer, and the presence of enterococci, Proteus and Shigella were observed. The proliferation of bacteria was due to the high temperature of the mineral water, sometimes exceeding 40C.--Copyright 1975, Biological Abstracts, Inc.
W76-09795

HYGIENIC STANDARDIZATION OF TIN DIBUTYL DIISOOCTYLTHIOGLYCOLATE IN WATER BODIES, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
A. S. Igumnov.
Gig Sanit. 2, p 13-17, 1975.

Descriptors: Public health, Water bodies, Organic compounds, Organoleptic properties, *Toxicity, *Pollutant identification.
Identifiers: Guinea pigs, Rabbits, Rats, *Tin dibutyl diisooctylthioglycolate.

Tin dibutyl diisooctylthioglycolate (TDDIOG) is highly toxic in rats, guinea pigs and rabbits and possesses pronounced cumulative properties. The threshold concentration of this substance according to the organoleptic index and its effect on the sanitary regimen of water bodies were found to be at a level of 0.05 and 0.5 mg/l. The ineffective dose of TDDIOG in a chronic sanitary toxicologic experiment amounted to 0.0004 mg/kg, which equaled its concentration in the water at a level of 0.01 mg/l. This concentration is suggested as its maximum permissible for water bodies.--Copyright 1975, Biological Abstracts, Inc.
W76-09797

AN OBSERVATION OF WATER QUALITY AND RED WATER IN STILL WATER FISH PONDS, (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
I. B. Kim, and M. J. Park.
Bull Korean Fish Soc. 7(2), p 69-78, 1974.

Descriptors: Water quality, *Phytoplankton, Ponds, Fish hatcheries, Asia, *Eutrophication, *Cyanophyta, *Chlorophyta, Temperature, *Dissolved oxygen, Zooplankton, Oxygen.
Identifiers: *Korea, Synechocystis-Aquatilis, *Fish ponds, *Red water.

A study of the dissolved O2 and phytoplankton in the pond water was carried out to determine the water quality and to investigate the cause of red water in fish ponds at Pusan Fisheries College (Korea) in 1972-1973. Measured O2 content during the period from Aug. 6-7, 1972 and was 23.95 ppm (328% of saturation) in daytime and 0.39 ppm (5%) in the early morning in water containing a heavy bloom of phytoplankton; in clear water the range of O2 content was 8.72-6.58 ppm. The occurrences of red water in 1972-1973 were always caused by the sudden death of Synechocystis aquatilis (Cyanophyta) when the water temperature was very high (30-33.5C). High mortality of the fish being reared followed. The phytoplankton observed included 133 spp. belonging to 55 genera in 23 families. Chlorophyta was dominant in number of specis; Cyanophyta in quantity. The zooplankton observed included 12 spp. belonging to 11 genera in 11 families.--Copyright 1975, Biological Abstracts, Inc.
W76-09799

ON THE EXTERMINATION OF POLYCLADS: CALCIUM HYPOCHLORITE (CAOC12) TREATMENT IN THE PERIOD OF HIGH WATER TEMPERATURE, (IN KOREAN),
H. C. Yang.
Bull Korean Fish Soc. 7(3), p 121-125, 1974.

Descriptors: *Water temperature, *Oysters, *Lethal limit, Calcium compounds, *Water treatment.
Identifiers: *Polyclads, Pseudostylochus-Obscurus, Stylochus-Ijimai, *Calcium hypochlorite.

Polyclads (Stoylochus ijimai and Pseudostylochus obscurus) which damage oysters were treated with CaOCl2 to determine the TLm (mean lethal treatment) concentration. The TLm and the extermination density as well as the growth of the oyster after treatment were checked. The higher the temperature and the longer the period of treatment, the lower the TLm. The greater the concentration of sea water, the higher the TLm, because of the weakened action of CaOCl2. When the oyster is treated with CaOCl2 at the oyster farm, its extermination concentration is 2.4-7.1 times higher than the TLm in freshwater. The growth rate was not affected after the treatment.--Copyright 1975, Biological Abstracts, Inc.
W76-09801

THE MERCURY CONTENT OF INDUSTRIAL FISH PRODUCTS: ITS RELATIVE VARIATION WITH THE TREATMENT (COOKING IN SALT WATER, PICKLING AND FISH PRODUCTION), (IN SPANISH),
Instituto Espanol de Oceanografie, Madrid (Spain).
A. Arevalo, J. Aravio-Torre, C. Masso, and C. G. Fernandez.
Bol Inst Esp Oceanogr. 179, p 1-16, 1974.

Descriptors: *Mercury, *Preservation, Fish, *Commercial fish, Fish diets, Water treatment, Production, Industrial wastes.
Identifiers: Pickling, *Fish products, Fish meal, Tuna.

Commercially preserved fish products have a Hg content different from that of the raw fish, but this variation is only relative since none of the treatment processes eliminates Hg. Generally, as water is lost in cooking, and as more NaCl, acetic acid or oil is incorporated in brining, the 'relative' Hg content increases, although the increase depends on the treatment and the fish species. These variations are of little significance. In the production of fish meal, the variation in Hg content is appreciable. Tuna meals normally contain 1.40 ppm Hg but may attain higher values depending on origin of the fish, age and size. If, in the manufacture of this meal, it were possible to dry it at 175 C (in spite of the slight charring that would occur) the Hg content would drop, not relatively but absolutely. Instead of fixing an upper concentration limit for Hg in fish products, it may be more logical to inform the public how much of the product they can eat daily. The Swedes are pioneers with this idea; their expert committee established the concept of the daily permissible diet.--Copyright 1975, Biological Abstracts, Inc.
W76-09802

STUDY OF THE EFFECT OF IRON ON THE HUMAN BODY AND LIVING CONDITIONS, (IN RUSSIAN),
G. P. Zarubin, and I. K. Lysogorova.
Gig Sanit. 2, p 20-23, 1975.

Descriptors: *Iron, Water pollution effects, *Human diseases, Potable water, Public health.
Identifiers: Erythrocyte, Leukocyte, Pruritis, Skin diseases(Human).

A study of persons using water containing Fe levels of 1-5 mg/l revealed undesirable effects in 62-100% of the cases. Water with Fe content of 4-5 mg/l caused skin problems (dryness, desquamation, pruritis). A high Fe content in drinking water did not affect Hb erythrocyte of leukocyte content.--Copyright 1975, Biological Abstracts, Inc.
W76-09803

EFFECT OF HEATED WATER DISCHARGE OF THERMAL AND NUCLEAR POWER PLANTS ON INVERTEBRATES OF COOLING PONDS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
L. A. Kititsina.
Gidrobiol Zh. 9(5), p 104-120, 1973.

Descriptors: *Thermal pollution, *Heated water, *Invertebrates, *Cooling ponds, Thermal powerplants, Algae, Bacteria, Nuclear powerplants, Europe, Production, Protozoa, Fish, Water pollution effects.
Identifiers: Bulgaria, England, France, Hungary, Poland, Scotland, USSR, United States.

A review of the literature is given elucidating investigations conducted in the USSR, Poland, Bulgaria, Hungary, England, Scotland (United Kingdom), France and the USA on the effect of heated water discharges of thermal and nuclear power plants on the quantitative development of fauna. The biology and production of the invertebrates of cooling ponds and the accumulation of metals and radioactive substances in aquatic organisms in the heating zone are considered. It is important to know the possible reaction of the aquatic biota of a specific pond to heating of the water. This necessitates further study of the effect of heat on the ecology, physiology, production and behavior of the aquatic biota, including bacteria, protozoa, algae and fish.--Copyright 1975, Biological Abstracts, Inc.
W76-09811

THE ALGAL POPULATION OF DUEMMER LAKE IN THE YEARS 1970/71, (IN GERMAN),
Niedersaechsische Landesinstitut Marschen und Wurtenforsch., Wilhelmshaven (West Germany).
K. Behre.
Ber Naturhist Ges Hannover. 118, p 163-190, 1974.

Descriptors: *Plankton, *Algae, *Bacteria, Cyanophyta, Diatoms, Chrysophyta, Lakes, Production, *Eutrophication, Degradation(Decomposition).
Identifiers: Bacteriophyta, Chlorococcales, Conjugatae, Duemmer, *Germany, Heterocontae, Ulotrichales, Zooflagellata, Steinhuder Lake(West Germany), *Duemmer Lake(West Germany).

The numerous species found during monthly studies from May 1970-Sept. 1971 show that this is a very eutrophic sea. Plankton density was much greater than in the otherwise comparable Steinhuder Lake (West Germany), and the plankton was very uniform, indicating even water distribution. Numerous Bacteriophyta, Cyanophyta, Zooflagellata, Chrysophyta, Heterocontae, Ulotrichales, Conjugatae and Diatomeae were found. Maximum production occurred in late summer and the minimum occurred in winter. From Jan.-April, Diatomeae predominated, followed by Chlorococcales, Cyanophyta and Chlorococcales again. In the littoral reed-filled areas, 439 forms of plankton were found but the algal population was not as uniform. The algal population was eliminated totally during the warmer summer months along the shore due to the decomposition activity of bacteria.--Copyright 1975, Biological Abstracts, Inc.
W76-09812

IRON-MANGANESE MICROORGANISMS STUDIED BY OVERGROWING TECHNIQUE, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institute of Lakes Keeping.
For primary bibliographic entry see Field 5A.
W76-09813

CHARACTERISTICS OF THIONIC BACTERIA FROM THE LAKES OF THE MARI ASSR, (IN RUSSIAN),
M. B. Vainshtein.
Mikrobiologiya. 44(1), p 151-155, 1975.

Descriptors: *Lakes, *Sulfur bacteria, Bacteria, Distribution, Eutrophication, Sulfides, Dissolved solids, Spatial distribution.
Identifiers: Russian-SFSR, Thiobacillus-Denitrificans, *USSR(Mari ASSR), Karst lakes, Denitrifying bacteria, Thionic bacteria, Vertical distribution.

Five karst lakes were investigated in the Mari ASSR (Russian SFSR, USSR). The vertical distribution of sulfur bacteria in water was correlated to the distribution and content of dissolved sulfides. The concentration of sulfur bacteria was higher in more productive lakes. A symbiotic culture of sulfur and denitrifying bacteria (not Thiobacillus denitrificans) was isolated from these lakes.--Copyright 1975, Biological Abstracts, Inc.
W76-09814

INDUCED CHANGE OF NITRATE REDUCTASE ACTIVITY IN MICROCYSTIS AERUGINOSA KUTZ. EMEND. ELENK, (IN RUSSIAN),
Kiev State Univ. (USSR).
L. A. Sirenko, and N. I. Komarenko.
Gidrobiol Zh. 10(3), p 73-75, 1974.

Descriptors: *Nitrates, *Eutrophication, Water pollution effects, Substrates, Enzymes.
Identifiers: *Microcystis-Aeruginosa, *Nitrate reductase activity.

The phenomenon of induction of nitrate reductase can be observed in natural populations of M. aeruginosa, the main causative agent of bloom. It appears with sufficiently high NO3 concentrations in the water and increases with increased NO3. The concentration of the substrate plays a major role in the phenomenon of enzyme induction and explains the weak development of M. aeruginosa in natural waters with a dominance of nitrates.--Copyright 1975, Biological Abstracts, Inc.
W76-09816

THE ROLE OF MICROFLORA IN THE PRODUCTIVITY OF A SALMON BREEDING LAKE, (IN RUSSIAN),
Akademiya Nauk SSSR, Borok. Inst. of Biology Inland Waters.
Y. I. Sorokin, E. B. Pavel'eva, and M. I. Vasil'eva.
Zh Obshch Biol. 36(1), p 126-134, 1975.

Descriptors: Lakes, *Bacteria, *Microbial degradation, Organic matter, Algae, *Decomposing organic matter, *Productivity, Protozoa, Rotifers, Daphnia, Salmon, Europe, Fish reproduction, *Mesotrophy, Eutrophication.
Identifiers: Daphnia, Diaptomus, Flagellate, Russian-SFSR, Stephanodiscus-Astraea, *USSR(Dalnye Lake).

The number of bacteria in the lake water varied from 0.2-5.3 .106/ml. Microbial production and decomposition are maximal in the surface layer in midsummer and in the bottom layer in autumn when dead algae are subject to microbial action. The role of allochthonous organic matter in Dalnye Lake (Russian SFSR, USSR) was less significant compared to that in the mesotrophic lakes and other waterbodies in the forest zone of Europe. An important role in the processes of mineralization of organic production belongs to the animals population of the lake (Diatoms (Stephanodisces astraia), Daphnia, protozoans, flagellate, rotifers, Diaptomus are discussed.)--Copyright 1975, Biological Abstracts, Inc.
W76-09818

ANTHROPOGENIC EFFECT ON CONTINENTAL, MARINE, AND OCEANIC BIOHYDROCOENOSES, (IN RUSSIAN),
N. K. Deksbakh.
Gidrobiol Zh. 9(4), p 111-117, 1973.

Descriptors: *Reviews, Urbanization, Technology, *Hydrobiology, Oil pollution, Reservoirs, Lakes, Industrial wastes, Effluents, Rivers, Streams, Equilibrium, Hydrologic aspects.
Identifiers: *Anthropogenic effects, *Biohydrocenoses.

The athropogenic effect is a result of the technological revolution and universal urbanization which in recent times has affected biohydrocoenoses with increasing intensity. A review of the literature on man's effect on continental biohydrocoenoses (reservoirs, lakes, river, canals, ponds, streams) and marine and oceanic biohydrocoenoses via pollution by oil and industrial effluents is presented. The anthropogenic effect changes the nature of the planet and leads to disturbance of the dynamic equilibrium in biohydrocoenoses and sometimes to their destruction.--Copyright 1975, Biological Abstracts, Inc.
W76-09819

COMPARATIVE EFFECTS OF DIQUAT PLUS COPPER SULFATE ON AQUATIC ORGANISMS,
Florida State Game and Fresh Water Fish Commission, Eustis. Eustis Fisheries Research Lab.
B. E. May, R. S. Hestand, and J. M. VanDyke.
Weed Sci. Vol. No. 21(3), p 249-253, 1973.

Descriptors: *Herbicides, *Diquat, Copper sulphate, Fish, Aquatic animals, Toxicity.
Identifiers: Hydrilla-verticillata, TAC, CSP.

Effects of herbicide combinations on aquatic invertebrates were evaluated in Inglis Reservoir, which is located in west coastal Florida. The addition of 6,7-dihydrodipyrido (1,2-a: 2'1' - c)pyrazinediium ion (diquat) plus the triethanolamine complex of copper sulfate (TAC) and diquat plus copper sulfate pentahydrate (CSP) for control of hydrilla (Hydrilla verticillata Casp.) decreased the number of invertebrates inhabitating the treated areas. The diquat plus CSP combinattion exerted the greatest effect upon invertebrate numbers. Both herbicide combinations, however, did alter significantly the number of taxonomic groups in the areas. Invertebrate declines were due more generally to resultant habitat changes (i.e., loss of hydrilla) than to direct herbicide toxicity. The response of fish to the effects of the herbicide treatments on invertebrates could be ascribed to dietary changes, decreased growth rates, and possible mortality.--Copyright 1974, Biological Abstract, Inc.
W76-09821

BIOLOGICAL INDICATORS OF ENVIRONMENTAL QUALITY. A BIBLIOGRAPHY OF ABSTRACTS,
For primary bibliographic entry see Field 5A.
W76-09860

FEEDING HABITS OF THE POPULATION OF WHITEFISH (COREGONUS LAVARETUS (L.)) IN HAUGATJERN: A EUTROPHIC NORWEGIAN LAKE,
Tromsoe Museum (Norway). Dept. of Norway.
For primary bibliographic entry see Field 2H.
W76-09882

RESULTS OF HYGIENIC AND TOXICOLOGICAL STUDIES OF PESTICIDES IN COUNTRIES OF THE COUNCIL OF MUTUAL ECONOMIC ASSISTANCE IN 1962-1972, (IN RUSSIAN),
Ustav Hygieny, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 5G.
W76-09884

COASTAL WATER RESEARCH PROJECT. ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 1975,
Southern California Coastal Water Research Project, El Segundo, Calif.
For primary bibliographic entry see Field 5B.
W76-09899

OIL IN THE ARCTIC,
Massachusetts Inst. of Tech. Cambridge.
D. P. Hoult, S. Wolfe, S. O'Dea, and J. P. Patureau.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A010 269, $6.00 in paper copy, $2.25 in microfiche. Department of Transportation, United States Coast Guard, Final Report No. CG-D-96-75, March 1975. 218 p, 13 fig, 42 ref, 3 append. DOT-CG-12438-A

Descriptors: *Arctic, *Oil spills, *Environmental effects, *Sea ice, *Cold regions, *Resources development, *Water quality, *water pollution sources, Ice, Tundra, Water resources, Continental Shelf.
Identifiers: *Outer continental Shelf, Environmental impact.

A description of the short term history of an oil spill - including the rate of spread, the area covered by the oil, and the effects of leads - is given. The stickiness of oil on sea ice was measured, and the results correlated with a theory which predicts how thick a layer of oil can stick to the ice in Arctic conditions. The evolution of an oil sill in the Arctic is a much slower phenomena than in temperate waters. The area covered, even from a supertanker spill, is quite small. The technological problem of combatting Arctic oil spills is much different than that in temporate water. It is not likely that barriers will be useful or needed. A system with rapid response time is not required. On the other hand, there seems to be no presently known way to locate easily, much less remove, oil trapped under oil in ice. The most important result of this work, which is substantiated by all the research to date, is that the oil in even a very large Arctic spill will be confined to a very small area due to natural processes. This conclusion is supported by both the spreading and pocketing experiments as well as the studies on oil evolution. As a corollary to this result, unlike the situation in temperate waters, there is little incentive to promptly clean up large oil spills, as the area of the oil spill will not measurably increase with time, while the oil remains in contact with sea ice. (Sinha - OEIS)
W76-09902

EFFECTS OF PETROLEUM POLLUTANTS ON ARCTIC MICROBIAL POPULATIONS,
Louisville Univ., Dept. of Biology.
R. M. Atlas, E. A. Schofield, F. A. Morelli, and R. E. Cameron.
Environmental Pollution, Vol 10, No 1, p 35-43, January 1976. 2 fig, 20 ref.

Descriptors: *Oil spills, *Water pollution effects, *Microbial degradation, Environmental effects, Resources development, Water resources, Continental shelf, *Alaska, Fossil fuels, Coasts, Ponds, Bacteria, Protozoa, Algae, Diatoms, Seepage, Fungi, Lichens, Microorganisms, Pseudomonas, Bays.
Identifiers: North Slope, Prudhoe Bay(Alas), Crude oil, Coastal ponds, Oil seepages, Sepcies diversity, Arctic, Environmental impact.

Microorganisms encounter oil in the Arctic from natural seepage and accidental spillages. Incubation of Prudhoe crude oil with water from coastal ponds along Prudhoe Bay resulted in several changes in the microbial communities. Bacterial populations increased by several orders of magnitude; ameoboid protozoa were replaced by flagellated protozoa; coccoid green algae completely disappeared; diatoms increased and blue-green and green filamentous algae appeared to be unaffected. The microbial populations associated with a natural oil seepage at Cape Simpson were markedly different from those of the adjacent areas. The seep was devoid of vascular plant cover and, in some areas, of bacteria. Fungi were found to be abundant in the bacteria-free regions. Lichens flourished in the older sections. Underlying oil slicks experimentally floated in Prudhoe Bay, the bacterial population increased, in large part attributable of oil degrading Pseudomonads, but species diversity appeared to be unaffected. (Sinha - OEIS)
W76-09909

ENVIRONMENTAL IMPACT STUDY OF OFFSHORE SAND AND GRAVEL MINING,
National Oceanic and Atmospheric Administration, Tiburon, Calif. Marine Minerals Technology Center.
For primary bibliographic entry see Field 6G.
W76-09910

BIOLOGICAL PRODUCTION PROCESSES IN THE URAL RIVER, (IN RUSSIAN),
Gosudarstvennyi Meditsinskii Institut, Orenburg (USSR).
G. N. Solovykh.
Gidrobiol Zh. 10(1), p 77-80, 1974.

Descriptors: *Primary productivity, *Decomposing organic matter, Industrial wastes, Domestic wastes, Effluents, Oxygen, *Biochemical oxygen demand, Photosynthesis.
Identifiers: *USSR(Orenburg), *Ural River.

The intensity of primary production and degradation of organic matter in a 35 km-long stretch of the Ural River below Orenburg (USSR) and the effect of industrial and domestic wastewaters on these processes were investigated. Data are given on the ratio of daily O2 consumption and total biological oxygen demand and seasonal dynamics of the intensity of photosynthesis and O2 consumption in the river water. The data show that the Ural River below Orenburg copes to a considerable extent with the effect of the city's effluents, but complete restoration of the biological production processes in the river is not occurring.--Copyright 1975, Biological Abstracts, Inc.
W76-09919

'TOXIC' OR 'POISONOUS' WATER, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.
S. V. Goryunova.
Izv Akad Nauk SSSR Ser Biol. 1, p 89-94, 1974.

Descriptors: Organic wastes, *Algae, *Toxicity, Algal toxins, Algal poisioning, *Poisions, Aquatic animals, *Water pollution, Industrial wastes.

Data are presented which reflect the interrelation between the mass pollution of natural waters with organic substances by uncontrolled industrial activity of man and the corresponding increasing development of toxic algal forms. The latter cause mass killing of aquatic animals either when being consumed as food or directly poisoning the water in places where domestic and wild animals come to drink and aquatic birds are present.--Copyright 1974, Biological Abstracts, Inc.
W76-09932

METABOLIC CYCLES FOR TOXIC ELEMENTS IN AQUEOUS SYSTEMS,
Minnesota Univ., St. Paul. Freshwater Biological Research Foundation.
J. M. Wood.
Rev Int Oceanogr Med. 31/32, p 7-16, 1973.

Descriptors: *Metabolism, *Toxicity, *Mercury, *Arsenic, Cycling nutrients, Elements(Chemical), Microorganisms, Systematics.

The elements are classified according to their toxicity and availability; toxic and relatively accessible elements such as Hg and As are studied in detail. Two types of equilibria, inorganic and organometallic, are considered. When an element is introduced into an environment rich in microbial activity, each valence state is made available for metabolic interconversions. The interconversion of inorganic complexes to organometallic complexes is important because the latter are readily transported and accumulated into tissues of high lipid content. This interconversion is made by methylating agents which are available for methyl transfer reactions in biological systems. The Hg and As cycles are summarized.--Copyright 1974, Biological Abstracts, Inc.
W76-09933

THE DISTRIBUTION OF COLIFORMS IN FRESH WATER, (IN JAPANESE),
Shimane Univ., Matsue (Japan). Faculty of Agriculture.
M. Matsumoto, Y. Nishitai, and A. Tanaka.
Bull Fac Agric Shimane Univ. 7, p 140-145, 1973.

Descriptors: *Coliforms, Freshwater, *Distribution, E. Coli, Streams, Euteric bacteria, Water pollution.
Identifiers: Enterobacter-aerogenes, *Japan.

The relationship between the degree of pollution and the types of coliforms in the water of the Mochida, a rural stream in Matsue City, Japan, was investigated. Water was sampled at 4 stations ranging from the nonsaprobic upper part to the saprobic lower part of the stream twice monthly from April 12, 1972-April 13, 1973. Coliforms were found in all samples, and the number of total bacteria, coliforms and Escherichia coli increased parallel to the degree of pollution. The ratio of coliforms to total bacteria was about 3:5% for all samples investigated. The ratio of E. coli to coliforms was 1:15%, and increased markedly with the degree of pollution. Intermediate types dominated over Aerobacter (Enterobacter) aerogenes in the nonsaprobic upper stream. Most of the E. coli and A. aerogenes isolates were identified as type I. Only 1 strain of pathogenic E. coli was found among the 259 strains examined.--Copyright 1975, Biological Abstracts, Inc.
W76-09934

USE OF THE PRINCIPLES AND METHODS OF RADIO-ECOLOGY IN SOLVING SOME URGENT PROBLEMS OF MAN'S EFFECT ON THE ENVIRONMENT, (IN RUSSIAN),
For primary bibliographic entry see Field 6G.
W76-09936

THE ACTION OF SOME POLLUTANTS ON THE GROWTH OF DAPHNIA MAGNA STRAUSS, (IN FRENCH),
Institutul de Medicina si Farmacie, Bucharest (Rumania).
S. Apostol.
Rev Roum Biol Ser Zool. 18(1), p 57-69, 1973.

Descriptors: *Daphnia, *Growth rates, Water pollution effects, Adaption, Inhibition.
Identifiers: Daphnia-Magna.

Different water pollutants inhibited the growth of young D. magna, especially in their 1st days of life. The organisms manifested an adaptation tendency, the normal growth values being attained more rapidly in lower concentrations. Under the influence of water pollutants, an increase of variance in the ensemble of populations was observed.--Copyright 1974, Biological Abstracts, Inc.
W76-09937

ORGANIC PRODUCTIVITY OF INSHORE AND OFFSHORE WATERS OF BARBADOS: A STUDY OF THE ISLAND MASS EFFECT,
Bellairs Research Inst., St. James (Barbados).
F. Sander, and D. M. Steven.
Bull Mar Sci. 23(4), p 771-792, 1973.

Descriptors: *Productivity, *Primary productivity, *Nutrients, *Diatoms, *Phytoplankton, Seasonal, *Copepods, Chlorophyll, Salts, Plant physiology.
Identifiers: *Barbados Island.

Repeated observations of primary and secondary production and related hydrographic and nutrient characteristics were made at inshore stations at Barbados from July 1968, to June 1970, for comparison with an offshore site. No evidence of regularly recurring variations of a seasonal nature was seen in the magnitudes of production and nutrient salts. Production showed progressive increase offshore to inshore consistent with an 'island mass' effect. Diatoms were consistently the most prominent phytoplankton group inshore. Increased primary production near land was mainly exploited by copepods. Assimilation numbers, which were considerably higher inshore than offshore, suggest that C fixation/unit of chlorophyll was less efficient in oceanic water and were indicative of the respective physiological states of the plant populations.--Copyright 1974, Biological Abstracts, Inc.
W76-09938

ESTUARINE ECOLOGIC SIMULATIONS,
Water Resources Engineers, Inc., Austin, Tex.
For primary bibliographic entry see Field 2L.
W76-09950

THE AQUATIC AND SUBAQUATIC BRYOPHYTIC VEGETATION OF THE BELGIAN PART OF THE RIVER SAMBRE, RELATED TO ECOLOGICAL CONDITIONS AND WATER POLLUTION, (IN FRENCH),
Liege Univ. (Belgium). Dept. of Botany.
A. Empain.
Lejeunia. 69, p 1-58, 1973.

Descriptors: *Water pollution, Vegetation, Europe, Rivers, *Ecological distribution, Data collections.
Identifiers: *Bryophytic vegetation, *Hepaticae, Musci, Ordination, *Belgium(River Sambre).

The biotope is described, with its geographical and physico-chemical characteristics, to point out the main features of the ecological factors. A list of the bryophytes (Musci; Hepaticae), with some taxonomic comments and the distribution of the species, is established followed by a conspectus of the bryophytic communities. Quantitative methods; global covering of all the species, coefficient of development, coefficient of difference and principal components analysis were used to organize the data. The last method, based upon the correlations between the used variables, allowed ordering the stations on physico-chemical data and the biological data for comparison of the two.--Copyright 1974, Biological Abstracts, Inc.
W76-09986

QUANTITATIVE ASPECT OF THE PHYTOPLANKTON OF THE BAY DU LEVRIER (MAURITANIA), (IN FRENCH),
Museum National d'Histoire Naturelle, Paris (France). Laboratoire des Peches Outre-Mer.
J. Reyssac.

Bull Mus Natl Hist Nat Ecol Gen. 5, p 101-112, 1973.

Descriptors: Bays, *Phytoplankton, Diatoms, *Nutrients, *Primary productivity, Dinoflagellates, Gymnodinium, Red tide, Seasonal, Eutrophication, Chlorophyll.
Identifiers: Coccolithophorids, Levrier, *Mauritania(Bay du Levrier).

The quantitative evolution of phytoplankton was studied during April-May 1972 in the Baie du Levrier. Population vary strongly in time and space but are always very abundant: 1 to 2 millions of cells/liter in the south and more than 3 millions in the north. The phytoplankton consists chiefly of coccolithophorids, diatoms and a dinoflagellate (Gymnodinium) the intense multiplication of which has caused red water (red tide). Concentrations of chlorophyll a are very high: 5 to 6 mg/cubic meter in the north of the bay and frequently more than 10 mg/cubic meter in the south. The primary production is high in every station. The monthly averages are included between 112 and 402 mgC/m3/j. The results show that the bay has a high fertility.--Copyright 1974, Biological Abstracts, Inc.
W76-09987

THE VEGETATION OF THE 'LUKNIANY LAKE' NATURE RESERVE IN THE MAZURIAN LAKE DISTRICT,(IN POLISH),
Akademia Rolniczo-Techniczna, Olsztyn-Kortowo (Poland). Inst. of Plant Biology.
B. Polakowski, J. Dziedzic, and E. Polakowska.
Ochr Przyr. 38, p 85-114, 1973.

Descriptors: *Aquatic plants, Lakes, *Vegetation, Europe, *Eutrophication, Water level fluctuation, Air temperature, Precipitation(Atmospheric), Plant grouping, Lake beds.
Identifiers: *Charales, *Poland(Lukniany Lake), Rushes, Salix-Aurita.

The nature reserve covers an area of 623 ha and lies in the district of Mragowo (Poland). It is a eutrophic lake, rather shallow due to deposits of calcareous gyttja. The differentiation of its ecological conditions is not great. The records of air temperatures, precipitation and oscillations of the water level in Lukniany Lake are presented. In 1966-1970 floral, phytosociological and pedological investigations were conducted. The plant associations described and mapped are as follows: Charetum aculeolatae, Charetum contrariae, Charetum asperae, Charetum tomentosae, Potametum lucentis, Scirpo-Phragmitetum, Acoretum calami, Caricetum paradoxae, Caricetum Hudsonii, Salici-Franguletum, Carici elongatae-Alnetum, Lolio-Cynosuretum and the community with Salix aurita. Associations of the Charales play the most important part. They cover the bottom of the lake in compact and extensive patches. There is a broad and dense belt of rushes along the shore line. The areal percentage and role of all the other associations listed above is not great.--Copyright 1974, Biological Abstracts, Inc.
W76-09990

PRIMARY PRODUCTION IN THE FROZEN LAKE BALATON,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
S. Herodek, and J. Olah.
Ann Inst Biol (Tihany) Hung Acad Sci. 40, p 197-206, 1973.

Descriptors: *Primary productivity, Lakes, *Light, Europe, Ice, Snow, *Chlorophyll, Spatial distribution, Phytoplankton, *Turbidity, Oxygen, *Photosynthesis, *Benthos.
Identifiers: Carbon-14, *Hungary(Lake Balaton), Frozen lakes.

One 10th normal light level was transmitted by ice covered by 4 cm snow and 1/2 by snow-free ice. The water was rather clear under the ice, so surface light reached the bottom. This illumination is higher than that in the unfrozen Lake Balaton (Hungary), where due to the turbidity caused by waves the bottom illumination is usually less than 1%. The chlorophyll a content of the water increased downwards. Related to surface it was 1 micro g/cm2. Similar vertical distribution was observed in the micro-algae occurring in the water under the ice. The chlorophyll a content of the bottom was 6.6-8.5 micro g/cm2 on 31 Jan. and 15.1-15.5 micro g/cm2 on the 5 Feb. 1973. When the ice was covered by snow, the primary production of phytoplankton, measured by 14C method, was 4mg C/m2/h and decreased downwards. Under the snow-free ice it was 20 mg C/m2/h and increased downwards. The production of the microphytobenthos was measured by both 14C and O2 methods. No production was found in April-Sept. due to the turbidity of water. In the frozen lake when ice was covered by snow even the gross primary production in the benthos was very low. In case of snowfree ice, intensive benthic photosynthesis was found. The primary production at 3 different days was 36 mg C/m2/h, 122 mg O2/m2/h and 115 mg O2/m2/h. In the lake covered by snow-free ice, the total primary production of the plankton and benthos was amounted to 560 mg C/m2/day, which similar to the summer maximum of planktonic production. In the ice-covered lake, the O2 content of the water was with 9.6 mg/l higher than before freezing.--Copyright 1974, Biological Abstracts, Inc.
W76-09991

THE PRIMARY PRODUCTION OF PHYTOPLANKTON IN LAKE BALATON APRIL-SEPTEMBER 1972,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
S. Herodek, and G. Tamas.
Ann Ins Biol (Tihany) Hung Acad Sci. 40, p 207-218, 1973.

Descriptors: *Primary productivity, Lakes, *Biomass, *Phytoplankton, *Algae, *Diatoms, Turbidity, Light, Eutrophication, Storms.
Identifiers: *Ceratium-Hirundinella, *Cyclotella-Bodanica, *Hungary(Lake Balaton).

The phytoplankton biomass, illumination and primary production were measured fortnightly at 4 depths in Lake Balaton (Hungary). In the samples 108 algal spp., 5 varieties and 1 form were found. The biomass of each species and the total phytoplankton were calculated from the number of algae and from the volume of individuals. Until the middle of July, the plankton was dominated by diatoms, the largest mass was formed by Cyclotella bodanica. Ceratium hirundinella became the dominating species first in the second half of the summer. The average biomass was 10.3 g/m2. Transparency is very unstable in the lake, due to the frequent swirling up of the mud. In storm, the primary production stops at 1 m depth because of light insufficiency while after a long calm period, in the clear water the deepest layer (3 m) exhibited the highest production. In general, at the surface the production is inhibited by excessive illumination, the maximum is found at 1 or 2 m, and at 3 m the same mass of algae produced 4 times less than at 1 m, owing to the insufficient light. The mean production and the standard error of the mean during 4 h were 118 + 8 mg C/m2. The average daily production was estimated to be 413 mg C/m2, the primary production during the half-year to 76 g C/m2. This primary production corresponds to that of the slight eutrophic lakes.--Copyright 1974, Biological Abstracts, Inc.
W76-09992

REACTION TIMES OF CERTAIN FRESHWATER FISHES TO A ROTENONE-CONTAINING PISCICIDE,
Natl. Parks Board, Pietermaritzburg, S. Afr.
D. T. Rowe-Rowe.
J South Afr Wildl Manage Assoc. 3(1), p 16-18, 1973.

Descriptors: Freshwater fish, *Rotenone, *Piscicides, *Fish control agents, Water temperature, Bass, Rainbow trout, Tilapia, Carp.
Identifiers: Barbus-Anoplus, Barbus-Gurneyi, Barbus-Natalensis, Barbus-Viviparus, Cent-Depress-Drug, Micropterus-Salmoides, Tilapia-Melanopleura, Tilapia-Mossambica, Yellowfish.

The reaction times (loss of equilibrium) for certain freshwater fishes were determined in laboratory tests (9 spp.) and in the field (10 spp.). Barbasco (6.8% rotenone) was used in all tests. Eight of the laboratory species were tested using 0.068 ppm rotenone concentration at approximately 21C. Field data were obtained from various size fish in water ranging from 13-26C and at concentrations of 0.034-0.136 ppm rotenone. The reaction time varied with size of fish and temperature of water. The following species were used in the experiments: Mozambique tilapia (or blue kurper) Tilapia mossambica; red-chested tilapia Tilapia melanopleura; Natal yellowfish or scaly Barbus natalensis; 3 spp. of minmow B. viviparus, B. gurneyi and B. anoplus; largemouth bass Micropterus salmoides; carp Cyprinus carpio; and rainbow trout Salmo gairdneri.--Copyright 1974, Biological Abstracts, Inc.
W76-09993

LABORATORY AND FIELD TESTS IN THE REVIVAL OF FISH AFFECTED BY ROTENONE,
Natal Parks Board, Pietermaritzburg, (South Africa).
D. T. Rowe-Rowe.
J South Afr Wildl Manage Assoc. 3(1), p 19-21, 1973.

Descriptors: *Rotenone, Laboratory tests, Fish control agents, Rainbow trout, Tilapia, Bass.
Identifiers: Barbus sp., Cent-Depress-Drug, Micropterus-Salmodies,

Various methods of reviving fish affected by rotenone were tested in the laboratory. The most successful method was simply to transfer affected fish (Barbus spp., Tilapia sp., Salmo gairdneri and Micropterus salmoides) to fresh water, as rapidly as possible after they lost equilibrium due to the rotenone. An alternative successful method was to add potassium permanganate simultaneously with the rotenone. These 2 methods, which gave success in the laboratory, also proved to be effective in the field.--Copyright 1974, Biological Abstracts, Inc.
W76-09994

5D. Waste Treatment Processes

EFFECTS OF STORM DISCHARGES ON RIVER WATER QUALITY,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5B.
W76-09401

POLYETHYLENE PIPE TACKLES DIFFICULT SEWER REPAIR JOB,
For primary bibliographic entry see Field 8G.
W76-09403

HOW MANY SEWER LEAKS CAN YOU AFFORD.
Weston (Roy F.), Inc., Houston, Tex.
For primary bibliographic entry see Field 8G.
W76-09404

ISOLATION OF SALMONELLA FROM SEWAGE AND SURFACE WATERS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of General Hygiene.
For primary bibliographic entry see Field 5A.
W76-09411

METHOD FOR ELIMINATING ORGANIC AND INORGANIC BOUND NITROGEN FROM DOMESTIC AND INDUSTRIAL WASTE WATER,
M. Dubach, and A. Scherler.
Canadian Patent 986,627. Issued March 30, 1976. Patent Office Record, Vol. 104, No. 13, p 83, March, 1976.

Descriptors: *Patents, *Nitrogen, *Ammonia, *Waste water treatment, *Municipal wastes, Industrial wastes, Nitrification, Denitrification, Sedimentation, Treatment facilities, Biological treatment, Aeration, Settling basins.

A method to eliminate organic and inorganic bound nitrogen from municipal and industrial waste water has been patented. A biological waste water treatment plant is utilized and consists of two stages connected in series. Each contains an aeration tank and a settling basin. Waste water entering the treatment plant will be aerated in the first stage aeration tank. It will subsequently be introduced into the settling basin where overflow is removed, free of oxygen. The mixture is then introduced into a second stage where it will again be aerated and subsequently introduced into a second stage settling basin. Favorable conditions for extensive nitrification of the ammonia are provided and a portion of the nitrified waste water is continuously recirculated from the settling basin of the second stage to the first stage. The recirculated portion of the waste water is denitrified in the settling basin of the first stage where ammonification of the organic bound nitrogen occurs as well as denitrification of the nitrate in the influent and the nitrate in the recirculated effluent. (Kramer-FIRL)
W76-09413

SANITARY WASTE TREATMENT PLANT,
Thetford Corp., Ann Arbor, Mich. (Assignee).
L. O. Eger, and S. C. Crosby.
United States Patent 3,950,249. Issued April 13, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 2, p 824, April, 1976.

Descriptors: *Patents, *Waste water treatment, *Biological treatments, Water reuse, Filtration, *Treatment facilities.

A plant for treating sanitary waste is patented. It comprises systems for delivery, biological treatment, and water recovery. The delivery system includes a flush-type toilet which has a demand actuator, a bowl for depositing sanitary waste, flush water supply means for transferring clear water from the water recovery system to the delivery system and for supply ing the clear water as flush water under pressure to the bowl when the demand actuator is actuated, and delivery means to deliver the sanitary waste adnd flush water to the biological treatment system when the demand actuator is actuated. The biological treatment system biologically reduces the sanitary waste it receives and discharges an effluent to the water recovery system. The water recovery system includes ultrafiltration means to separate the effluent into an effluent concentrate and a water permeate. The ultrafiltration means has a tubular semipermeable membrane. Effluent is introduced into its one end axially under pressure and effluent concentrate discharged from the other. The ultrafiltration means also has a permeate collector tube surrounding the tubular membrane to collect, at a lower pressure, permeate passing through the membrane, and recirculation means which include a pump to return a portion of the effluent concentrate to the biological treatment system and for returning the remainder of the effluent concentrate at the first pressure to the ultrafiltration means to be further separated into water permeate and effluent concentrate, water storage means, and secondary filtration means to receive and polish the water permeate, in communication with the ultrafiltration means allowing the permate to be discharged at the second pressure from the ultrafiltration means to the secondary filtration means for polishing and discharge as clear water to the water storage means. The water storage means communicates with the delivery system to transfer the clear water to it by flush water supply means. (Snyder-FIRL)
W76-09414

AERATED SEWERAGE DISPOSAL,
A. J. Smith.
United States Patent 3,951,804. Issued April 20, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 3, p 1347, April, 1976. 1 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewage disposal, *Aeration, *Patents, Equipment, *Septic tanks.
Identifiers: Rotary agitators(Wastes).

An aerated sewage disposal system has been patented. It comprises a septic tank, an enclosed compartment for aeration, and a rotary agitator. The septic tank has an inlet for sewage and an outlet for discharging liquids. The enclosed aeration compartment has an inlet to receive liquids directly from the discharge outlet of the septic tank and an outlet for aerated liquids. The compartment has side wall structure, a bottom wall, and rounded corners that extend between the side wall structure and the bottom wall. The rotary agitator is located in the enclosed aeration compartment to agitate liquids and cause them to flow downward in the compartment. A tubular shaft extends downward to approximately the agitator's level to carry and rotate the agitator and conduct air downward into the downward flowing agitated liquid. It has an air outlet in the compartment at approximately the agitator depth. A motor is connected to the upper end of the tubular shaft to rotate it. The rounded corners are located laterally and below the agitator sufficiently close to it to turn the flowing liquid, which contains air, upward along the side wall structure. The aeration compartment has vent means to allow air to pass between its interior and exterior. The volume of liquid and sewage in the tank, filled to its outlet level, exceeds the volume of liquid and sewage in the compartment when filled to the level of its outlet and more than 50% of the sewage solids are trapped in the tank. Control means connect with the motor, operating it intermittently, with substantially more time off than time on. There is a smaller additional tank with an inlet connected to the compartment outlet; an outlet connected to the leach line; and means, which include a pump, to return aerated liquids from the additional tank to the compartment. (Snyder-FIRL)
W76-09415

SLUDGE REMOVAL SYSTEM,
Ecodyne Corp., Lincolnshire, Ill. (Assignee).
R. L. Shaffer, and D. G. Mason.
United States Patent 3,951,819. Issued April 20, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 3, p 1352, April, 1976. 1 fig.

Descriptors: *Waste water treatment, *Sludge treatment, Sludge, Equipment, *Patents, Settling basins.
Identifiers: Sludge removal, Clarification, *Clarifier tanks.

An improved assembly for sludge removal in a circular clarifier tank having an inlet for receipt of liquid influent with entrained solids, an upper overflow outlet for removal of clarified liquid, and a bottom surface on which settled solids deposit is patented. The sludge removal assembly comprises a suction arm, sludge conduits, vertical riser tubes, a sightwell assembly, and valve assembly means for flow control. The suction arm has self-supporting sludge conduits of differing lengths which extend outward from and are mounted for rotation around an axis which is substantially vertical extending through the tank's center. The sludge conduits are secured to each other in a horizontal plane above the bottom surface of the tank. The sludge conduits have suction ports for inlet along their bottom surfaces adjacent to their outer ends to receive sludge from the bottom surface of the tank. The lower ends of many riser tubes which are substantially vertical are secured to the corresponding sludge conduits' inner ends. The sightwell assembly is positioned above the riser tubes' upper ends. Its lower portion is below the tank's static liquid level, and its upper portion is above the liquid level. Valve assembly means for flow control are associated with each riser tube's upper end for controlling the flow rates from the riser tubes into the sightwell assembly. These valve assembly means include adjustable orifice means whose lower portion is below the tank's static liquid level and whose upper portion is above this level. (Snyder-FIRL)
W76-09416

SEWAGE TREATMENT TANK AND TUBE SETTLER,
Jet Aeration Co., Cleveland, Ohio. (Assignee).
J. R. Snyder.
United States Patent 3,951,817. Issued April 20, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 3, p 1351, April, 1976. 1 fig.

Descriptors: *Waste water treatment, Equipment, *Patents, *Settling basins, Sedimentation, *Sewage treatment.
Identifiers: Tube settlers.

A tube settler has been patented which include numerous generally parallel spaced plates. Each plate has two faces, an opposed side, and end edge portions. Each plate also has numerous generally parallel spaced deflector members which extend outwardly from and are integrally connected to its first face and terminate adjacent to and spaced from an adjacent plate's second face. Each deflector member has wall means defining an elongated chamber with side walls tapering toward each other as they extend away from the plate to which they are connected. The elongated chamber also has opposed end walls. The deflector members extend outwardly generally perpendicular to the plates and in a direction at an acute angle to the side edge portions of the plates. The invention also includes means for holding the plates in their generally parallel spaced relationship. (Snyder-FIRL)
W76-09417

MARINE SEWAGE DISPOSAL DEVICE,
N. H. Siegel.
United States Patent 3,951,803. Issued April 20, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 3, p 1346-1347, April, 1976. 1 fig.

Descriptors: *Sewage disposal, *Sewage treatment, Equipment, *Patents, Tanks, Filtration, Heat, *Waste water treatment.
Identifiers: Marine sewage disposal.

A device for sewage disposal, adapted to receive discharge from a marine toilet, was patented. It incorporates means to kill coliform bacteria in the sewage. Storage tank means with an inlet to receive untreated sewage are included. Septum means within the tank means define an enclosure, vertically oriented. The septum means have lower and upper openings which communicate with the storage tank means' interior for recycling nonparticulated sewage. There are macerator means disposed in the vertically oriented enclosure with an impeller at its lower end. The enclosure has fil-

tering screen means at its upper end, forming an outlet to pass particulated sewage impelled by the macerator. Pre-treatment storage means with an inlet bordering the screen which receives particulated sewage are also included. A compartment for sewage treatment is disposed beneath the pre-storage means. First valving means form an outlet at the pre-treatment storage means' lower end and an inlet to the sewage treatment compartment, allowing particulate sewage to pass by gravity from the pre-treatment storage means to the treatment compartment. Heating means are provided, including two electrodes disposed within the treatment compartment which operate automatically when sufficient particulate sewage is present, to form an ionizable fluid. Second valving means are disposed at the lowest part of the treatment compartment to form an outlet to drain it of treated waste. Thermostatic means are included for the treatment compartment, to determine completion of a treatment cycle and control operation of the valving means. (Snyder-FIRL)
W76-09418

SLUDGE CONTROL AND DECANT SYSTEM,
Harsco Corp., Harrisburg, Pa. (Assignee).
T. D. Ward, and M. W. Ray.
United States Patent 3,951,788. Issued April 20, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 3, p 1341-1342, April, 1976. 1 fig.

Descriptors: *Sewage treatment, *Patents, *Biological treatment, Aeration, *Waste water treatment, Pumps, *Sludge treatment, Separation techniques.
Identifiers: *Decanting(Wastes).

A system for sewage treatment is patented, comprising an aeration tank, a clarifier tank, a baffle between the aerator tank and the clarifier tank, a decant tank, gravity fluid flow communication means between the aeration tank and the decant tank, a pump and means connecting it for removing clarified liquid from the upper portion of the decant tank and to deliver the clarified liquid to the aeration tank, a sludge digester container, a sludge discharge line with a second pump, and first and second timer means. Means to aerate the waste water are included in the aeration tank. Liquid flows over the upper edge of the baffle from the aeration tank into the clarifier tank. The means for gravity flow communication have an intake at an elevation below that of the baffle's upper edge to prevent floating matter from entering the decant tank. The discharge line for sludge connects with the decant tank's lower portion and sludge digester container. The first timer means is connected to the first pump so that it will remove clarified liquid at selected intervals for selected time periods. The second timer means is connected to the second pump so that it will discharge sludge from the decant tank for selected time periods and at selected intervals to maintain the aeration tank's biological balance. (Snyder-FIRL)
W76-09419

APPARATUS FOR SEWAGE TREATMENT AND WASTEWATER RECLAMATION,
Hebrew Univ., Jerusalem (Israel); and Yissum Research Development Co., Jerusalem (Israel). (Assignee).
G. Shelef.
United States Patent 3,954,615. Issued May 4, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 1, p 246, May, 1976. 1 fig.

Descriptors: *Waste water treatment, Algae, Lagoons, *Aeration, *Biological treatment, *Patents, Recycling, Oxygen, Ponds, *Aerated lagoons, Water reuse, *Sewage treatment.

An improvement has been patented in a system to treat waste water using algae. The technology consists of a pond which contains means for channeling the waste water along an endless path and means to aerate and maintain the flow of waste water. According to the improvement, the pond is deeper beneath the aeration means than the path depth in the remaining parts of the pond. The greater depth provides a solubility gradient which increases the amount of oxygen than can be dissolved into the liquid by the aeration means. (Snyder-FIRL)
W76-09420

SEPARATION OF SLUDGE,
W. Aldag.
United States Patent 3,953,328. Issued April 27, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 4, p 1847, April, 1976. 1 fig.

Descriptors: *Sludge treatment, *Patents, *Separation techniques, Suspended solids, *Waste water treatment, Aeration, Equipment.
Identifiers: Clarification.

A method was patented for separating sludge and suspended material from the liquid being purified. Liquid flows into the clarification chamber by way of an aeration chamber. In the clarification chamber a rising liquid stream is established whose speed of flow decreases as this liquid rises. Suspended material in this rising stream is concentrated in an intermediate zone of the clarification chamber in which the tendency of the material to sink due to gravity is approximately equal to the tendency for it to be carried upward in the stream. The concentrated material is drawn off by suction means at the intermediate zone and at least partly fed back to the aeration chamber's upper zone. The suction means disposition is varied to the level of the intermediate concentration zone. The aeration chamber and the clarification chamber are in fluid communication to receive liquid in the rising stream from the former. The clarifying chamber is shaped to decrease the flow speed of the stream while the liquid rises. There are one or more pumps with an outlet in the aeration chamber and a suction pipe arranged with its inlet in the clarification chamber at an intermediate level between the outlet level and the fluid communication. The suction pipe inlet is at such a level that suspended material in the liquid stream, which concentrates at the intermediate zone, is drawn out of the clarification chamber with the pump to be at least partially returned to the aeration chamber at an upper level. (Snyder-FIRL)
W76-09421

SEWAGE TREATMENT PROCESS,
Central Contra Costa Sanitary District, Walnut Creek, Calif. (Assignee).
D. S. Parker.
United States Patent 3,953,327. Issued April 27, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 4, p 1847, April, 1976. 1 fig.

Descriptors: *Waste water treatment, *Patents, *Sewage treatment, *Aerobic treatment, Nitrification, Denitrification, *Nitrogen compounds.
Identifiers: Anoxic conditions.

A process has been patented for treating sewage which contains nitrogen compounds. First, nitrogen compounds are converted to the nitrate form by nitrification. The nitrified sewage is then subjected to substantially anoxic denitrification in the presence methanol. The denitrified sewage is then stabilized by thoroughly aerating it under agitation conditions. The sewage is then flowed from the stabilization step and clarified, producing an effluent and sludge. The sludge is recycled directly to the denitrification step so that it will also be subjected to substantially anoxic denitrification. The purified effluent is withdrawn from the process. (Snyder-FIRL)
W76-09422

SEWAGE TREATMENT AERATION SYSTEMS,
Water Pollution Control Corp., Milwaukee, Wis. (Assignee).
P. M. Thayer.
United States Patent 3,953,553. Issued April 27, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 4, p 1905-1906, April, 1976. 1 fig.

Descriptors: *Patents, *Aeration, *Sewage treatment, *Waste water treatment, Equipment.
Identifiers: Header-connector assembly(Tanks).

A prefabricated header-connector assembly adapted for inclusion in a sewage aeration tank by the attachment of a low pressure air supply and diffusers to several inter-connected header-connector assemblies has been patented. It maintains the attached diffusers properly aligned in a common plane. It comprises a header and numerous connectors secured to it at different locations. The header is of weldable material with numerous nipples outwardly projecting from it at spaced locations. Each connector is oriented transversely to the header. The connectors have means for coupling with diffusers. Each connector has nipples drawn from it with their open ends welded to different header nipples. (Snyder-FIRL)
W76-09423

METHOD AND APPARATUS FOR REJUVENATING A BED OF GRANULAR FILTER MEDIUM,
Hydromation Filter Co., Livonia, Mich. (Assignee).
G. Hirs.
United States Patent 3,953,333. Issued April 27, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 4, p 1849, April, 1976. 1 fig.

Descriptors: *Patents, *Filtration, *Suspended solids, Equipment, Recycling, Filters.
Identifiers: *Granular filters.

An improvement has been patented for a method of filtering lint-like and particulate contaminants from a contaminated liquid by passing it through granular filter medium in a bed contained in a housing where the contaminants accumulate and at least some particulate contaminants and the filter granules agglomerate. The improvement consists of renewing the filter medium bed after an appreciable quantity of contaminants accumulate. This is done by expanding the filter bed and violently agitating it to break the agglomeration into particulate contaminants and filter granules. The filter bed is reformed with the lint-like material predominantly in its upper portion, the larger broken-up particulates in the lowest portion, and the other particulate interspersed through the bed. Diluting liquid is introduced into the bed between its lower and upper surfaces. Simultaneously a portion of this liquid flows upward fairly rapidly through only the part of the bed above the point where the liquid is introduced to expand and upwardly backwash interspersed lint-like contaminants and particulates. A slurry of interspersed particulates and granular filter material mixed with the rest of the dilution liquid is separately withdrawn below a point where liquid is introduced and flows in a continuous path including a cleaning element which removes at least part of the particulates from the mixture. The filter material is returned to the bed in the liquid flow. The liquid flow is terminated after sufficient cleaning of the filter bed. The bed is then reformed for further filtration of dirty liquid. (Snyder-FIRL)
W76-09424

STABILIZATION OF WASTE MATERIAL,
General Signal Corp., Rochester, N. Y. (Assignee).
E. H. Bradley.
United States Patent 3,953,331. Issued April 27, 1976. Official Gazette of the United States Patent Office, Vol. 945, No. 4, p 1848, April, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Oxidation, Equipment, Aeration.
Identifiers: Tanks.

A system has been patented to purify wastes. It includes two reaction tanks, each internally unobstructed, and means to deliver waste material for purification to the first tank. The delivery means include a conduit and a pump means. Means are also provided to introduce an oxidizing agent in the conduit in front of the pump means. A mixture of chemical oxidizing agent and waste material is pumped into the first reaction tank. Discharge conduit means from the first tank are directly connected to the delivery means and to the second tank to recirculate a portion of the mixture through the first tank and to deliver the remainder of the mixture to the second tank. Pressure is maintained in the tank so that fairly rapid chemical oxidation can take place during the mixture's entire circulation through the tanks. A rotatable impeller tends to oppose the fluid flow from the second tank while the first pump pumps the pressurized fluid to the first tank. A method for stabilizing waste material is also included. An oxidizing agent is mixed with waste material to be stabilized, and the mixture is rapidly circulated under pressure in the second zone where the oxidation is permitted through the two zones. The conduit and the rotatable impeller simultaneously maintain pressure in these zones by engaging the rotatable impeller in the conduit so as to tend to oppose flowing of the mixture from the second zone to the conduit. (Snyder-FIRL)
W76-09425

SEPTIC TANK SYSTEM,
A. L. Wilkerson.
United States Patent 3,954,612. Issued May 4, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 1, p 245-246, May, 1976. 1 fig.

Descriptors: *Septic tanks, *Patents, *Sewerage, Waste disposal, Conduits, Equipment, Effluents, *Sewage treatment, Domestic wastes, *Waste water treatment.

A septic tank system has been patented. The septic tank has an inlet for receiving sewage and, just below its top, an outlet for the liquid effluent, with a tributary connected to it for the effluent, allowing it to soak into the ground. The tributary comprises an elongated ditch filled with a substance such as gravel to about the outlet's top and means in the tributary to indicate above the ground surface the effluent level in the tributary. The indicator facilities include a vertical conduit that extends from above the ground surface to the lowest part of the ditch that forms the tributary. The conduit has openings with the associated screen whose mesh size is selected to allow liquid entry into the conduit but not entry of gravel from the ditch into the pipe, allowing flow of effluent from the tributary into the conduit until the effluent level in the tributary is reached. A float in the conduit floats in the effluent. Means attached to this float extend above the surface of the ground to indicate the level of effluent in the tributary. Excess effluent can be pumped directly from the tributary before causing sewage back-up to the septic tank. This includes a second conduit that extends from the ground surface through the gravel to about the tributary bottom. This conduit has perforations adjacent to its bottom with the associated screen whose mesh size is selected to allow liquid effluent but not gravel from the ditch to enter the conduit. In this way, the effluent can be pumped from the tributary to substantially remove all the liquid effluent in the ditch. (Snyder-FIRL)
W76-09426

WASTE TREATMENT PLANTS,
Foster Wheeler John Brown Boilers Ltd., London (England). (Assignee).
For primary bibliographic entry see Field 5E.
W76-09427

PROCESS AND APPARATUS FOR THE INCINERATION OF AQUEOUS SEWAGE SLUDGE,
Myrens Verksted A/S, Oslo (Norway). (Assignee).
For primary bibliographic entry see Field 5E.
W76-09428

APPARATUS FOR TREATING INDUSTRIAL AND DOMESTIC WASTE WATERS,
Degremont, Rueil-Malmaison (France). (Assignee).
A. B. Turner.
United States Patent 3,956,128. Issued May 11, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 2, p 731-732, May, 1976. 1 fig.

Descriptors: *Waste water treatment, *Patents, Domestic wastes, Industrial wastes, Equipment, *Aeration, Biochemical oxygen demand, *Filtration, *Filters.
Identifiers: *Combined treatment.

A system to treat domestic and industrial wastes has been patented. It includes a tank, a filter in the tank, and an aerated packed column mounted above the filter in the tank. The column includes bacteria support media with approximately 50 sq ft/cu ft surface area. Screened sewage with suspended solids is introduced into the tank via an inlet and passed downward through the column and filter. Effluent outlet means are included at the lowest part of the tank to remove effluent. By-pass passage facilities which include a pump extend from the outlet to the lower portion of the tank for recirculating some of the effluent into the tank. Means are connected to the by-pass passage to aerate the recirculated effluent, to cause the air upon entering the tank to separate as small bubbles from the recirculated effluent, and to force these bubbles upward through the support media, providing oxygen for microorganisms growing on it that biologically remove the biochemical oxygen demand (BOD) loading in the sewage. Means positioned on the tank receive and burn floc rising to the tank's surface from the support media. (Snyder-FIRL)
W76-09429

SEWAGE SEPTIC SYSTEM FOR A PLURALITY OF DRAIN FIELDS,
Langley Hill Quarry, Woodside, Calif. (Assignee).
J. G. Dempsey.
United States Patent 3,956,137. Issued May 11, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 2, p 735-736, May, 1976. 1 fig.

Descriptors: *Patents, *Septic tanks, *Sewage treatment, *Drainage, Domestic wastes, Pipelines, Waste disposal, Treatment facilities, *Waste water treatment.

A septic sewage system has been patented. It comprises a septic tank, numerous septic drain fields, and diversion means to direct the effluent to the drain field or fields selected. The septic tank supports a bacteriological action. It includes a sewage settlement compartment and an effluent compartment that communicates with the settlement compartment. An inlet pipe communicates with the settling compartment to deliver raw sewage. An outlet pipe communicates with the effluent compartment to discharge effluent. Each septic drain field has a pipeline to convey effluent. Diversion equipment is connected between the outlet pipe of the effluent compartment and the septic drain field pipelines. This includes an enclosure into whose interior the outlet pipe passes, having a lid to facilitate access to its interior, and a gate valve within the enclosure for each drainage field connecting the outlet pipe with its associated field's pipeline. Each gate valve has a housing connecting the outlet pipe with the pipe line. A gate within the housing can be moved between a position blocking flow between the outlet pipe and the associated drain field pipeline, and a retracted position that permits effluent flow from the outlet pipe through the pipe line. (Snyder-FIRL)
W76-09430

WASTE PURIFICATION SYSTEM,
Bio-Kinetics Inc., San Rafael, Calif. (Assignee).
J. R. Hulls.
United States Patent 3,955,318. Issued May 11, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 2, p 464, May, 1976. 1 fig.

Descriptors: Algae, *Patents, *Sewage treatment, *Waste water treatment, Nutrient removal, Aeration, Nitrogen, Phosphorus, Recycling, Water purification, *Biological treatment, Biodegredation.

A continuous method to grow substantially unicellular algae, simultaneously purifying biodegradable wastes that contain aerobic bacteria, has been patented. Such a waste material would be sewage after communication and removal of most particulate matter, including nonbiodegradable matter, and after being largely freed from turbidity so that light can effectively penetrate it. An aqueous mixture of the algae and waste material is prepared. The waste material provides nitrogen and phosphorous for the algae and is mixed in an amount sufficient to support its growth. The mixture is aerated, agitated, and supplied with air and carbon dioxide in an amount balancing bacterial and algal growth. The agitated mixture is circulated in many cycles. It is then exposed in each cycle for approximately 0.5 sec to 2 sec to light to induce photosynthesis and then subjected to a dark period. Photosynthesis is effected without excessive oxidation of thylakoids, which are an inherent part of algae. The dark period is sufficient for regenerating the thylakoids. Algae are grown and substantially all of the waste material is consumed. An algae product and purified water effluent are separately recovered, recirculating some of the algae product. (Snyder-FIRL)
W76-09431

WASTE TREATMENT APPARATUS,
Ecolotrol, Inc., Bethpage, N. Y. (Assignee).
J. S. Jeris, C. Beer, and J. A. Mueller.
United States Patent 3,956,129. Issued May 11, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 2, p 732, May, 1976. 1 fig.

Descriptors: *Biological treatment, *Patents, *Denitrification, Equipment, *Waste water treatment, Separation techniques, Oxidation.
Identifiers: *Fluidized beds.

Equipment has been patented to biologically denitrify water that contains oxidized nitrogen. It comprises a substantially vertically disposed elongated container, a manifold that is disposed toward the bottom of the container to control passage of water, an inlet to allow the container to receive water for processing, a fluidized bed of denitrifying microorganisms attached to a solid particulate carrier disposed in the container above the manifold, and means to add a carbon source to the fluidized bed. The fluidized bed is arranged to receive the water from the manifold and convert biologically substantially all the oxidized nitrogen being removed to water, nitrogen gas, and cellular material. The container has outlet means for receiving the processed water and at least some particulate carrier having excess cellular material. Means are provided for separating the processed water from the carrier. Processing means are connected to the separating means to receive the separated carrier, and for separating the excess cellular material and the particulate carrier. (Snyder-FIRL)
W76-09432

WASTEWATER TREATMENT SYSTEM WITH CONTROLLED MIXING,
Air Products and Chemicals, Inc., Allentown, PA. (Assignee).

C. S. Block, M. S. Chen, and O. J. Noichl.
United States Patent 3,954,606. Issued May 4, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 1, p 243, May, 1976. 1 fig.

Descriptors: *Patents, *Biochemical oxygen demand, *Aeration, *Oxygenation, *Waste water treatment, Equipment, Mixing, Control.

A method has been patented for oxygenating and reducing the biological oxygen demand of a mixed liquor. The mixed liquor flows through an aeration basin's elongated liquid zone. This zone is non-partitioned for 80% or more of the mixed liquor depth. Oxygen-rich aeration gas is introduced into the aeration basin. The mixed liquor is oxygenated with the aeration gas by rotating numerous surface aerators spaced along the length of the liquid zone. Surface baffles are provided between all or some of the surface aerators. The penetration depth of the surface baffles into the mixed liquor is maintained between 2 and 20% of the mixed liquor depth. The mixed liquor backflow ratio is controlled to produce effective liquid staging in the order of 30 to 80% or more by maintaining the aerator mixing factor between 10 and 550. The aerator mixing factor is revolutions per minute of the surface aerators multiplied by the ratio of the diameters to the linear velocity of the liquid through the liquid zone. (Snyder-FIRL)
W76-09433

CATIONIC ACRYLAMIDE-STYRENE COPOLYMERS AND FLOCCULATION OF SEWAGE THEREWITH,
American Cyanamid Co., Stamford, Conn. (Assignee).
A. T. Coscia, H. P. Panzer, and J. A. Sedlak.
United States Patent 3,956,122. Issued May 11, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 2, p 730, May, 1976.

Descriptors: *Patents, *Waste water treatment, *Flocculation, *Polymers, *Separation techniques, Suspension, Suspended solids, Emulsions, Cations.
Identifiers: Cationic acrylamide-styrene.

A process has been patented to flocculate solids suspended in an aqueous medium. An effective but small amount of an aqueous dispersion of a cationic vinyl polymer is uniformly added to the medium as flocculant for the solids. The polymer comprises 40 mol percent or more of N-(di(C1-3alkyl)aminomethyl)acrylamide hydrophilic cationic linkages, at least 5 mol percent of vinyl hydrophobic linkages, and up to 10 mol percent of acrylic acid hydrophilic anionic linkages. The number of hydrophobic linkages is large enough for the polymer to be insoluble in pure water and small enough for the polymer to be auto-dispersible in pure water. The polymer is distributed through the medium, flocculating a substantial portion of the solids. The flocculated solids and the medium are separated. (Snyder-FIRL)
W76-09434

MICROBIAL REACTIONS IN FACULTATIVE OXIDATION PONDS -- I. THE ANAEROBIC NATURE OF OXIDATION POND SEDIMENTS,
Auckland Univ., (New Zealand).
O. D. Brockett.
Water Research, Vol. 10, No. 1, p 45-49, 1976. 4 tab, 11 ref.

Descriptors: *Anaerobic conditions, *Methane, *Oxidation lagoons, Microorganisms, Kinetics, Sulfide, *Waste water treatment, Bacteria, Sediments, Acids, Microbiology.
Identifiers: Volatile acids, *Microbial reactions.

Volatile acid production, sulfide levels, and methane fermentation were compared in deep and shallow areas of faculative oxidation ponds. Acids were measured by the column partition chromatography method, and methane was collected by displacement with a filter funnel. Volatile acid utilizing sulfide producing bacteria and total sulfide levels were determined by standard methods. Volatile acids concentration, methane production, and sulfate reduction all showed significant increase with increase in pond depth. These results indicate the formation of better anaerobic conditions in the deep areas of the ponds. Gas collected in different areas of the oxidation pond system at different times had essentially the same composition, indicating the uniformity of the anaerobic nature of the ponds. Seasonal changes in volatile acid concentration occurred when biological organic matter from waste fed to the ponds during the winter months and from the pond biomass rapidly decomposed. The volatile acid content returned to lower levels after the load disappeared. (Snyder-FIRL)
W76-09435

PHOSPHATE REMOVAL--TACKLING EUTROPHICATION FROM THE OTHER SIDE,
F. Roberts.
Surveyor, Vol. 147, No. 4370, p 25, March 12, 1976.

Descriptors: *Nutrient removal, *Waste water treatment, *Phosphates, *Nitrates, Eutrophication, *Sewage treatment, Chemical precipitation, Flocculation, Water pollution control, Biochemical oxygen demand.
Identifiers: *Chemical treatment.

While BOD removal has been the primary aim of waste water treatment in the United Kingdom, increasing attention in other European countries has been paid to phosphate removal and the control of eutrophication. Both nitrates and phosphates come from land drainage and sewage effluents. However, it is supposed that phosphates would be easier to control, since a larger proportion comes from the sewage effluent. Typically, 70% of nitrates comes from land drainage and 80% of phosphate from sewage effluent. Such countries as Switzerland, Sweden, and Canada have been developing phosphate removal as an integral part of sewage treatment. Phosphate control may be achieved either by reducing the phosphorus content of sewage (such as done in Canada by requiring that detergents should have a substitute for NTA) or alternatively, by chemical treatment at the sewage works. This involves the use of lime, aluminum salts or ferric salts; the dose for alum could be about 150 mg/liter. The chemical may be incorporated at the beginning of treatment or as an additional process. The effect of phosphorus removal efforts on an already heavily enriched lake or inland waterway are not clear, but experts who treat phosphate problems in an acute form believe that the effort is worthwhile. (Kramer-FIRL)
W76-09436

WHO SAYS SEWAGE TREATMENT PLANTS HAVE TO BE UGLY,
Texas Dept. of Health Resources, Austin. Div. of Wastewater Technology and Surveillance.
W. R. Dinges.
Water and Wastes Engineering, Vol. 13, No. 4, p 20-23, April, 1976. 2 tab.

Descriptors: *Sewage treatment, *Waste water treatment, *Biological treatment, Aquatic plants, Nutrient removal, Floating plants, Water hyacinth, *Treatment facilities.

Studies on the feasibility of using aquatic plants and animals to produce further reduction of undesirable suspended and dissolved substances from water following bacteria and algae treatment phases are being conducted at the Williamson Creek Wastewater Treatment Plant at Austin, Texas. The pilot system consists of an area of 0.14 acres divided into four ponds separated by crushed limestone rock barriers. Water hyacinths are cultured in the first two ponds while the last two ponds are used to permit the regrowth of other plant species and to evaluate the suitability of several fish species for consumption of vegetation produced. Water hyacinths accumulate heavy metals and trace organics from waters with contamination levels below detectable limits. The effluent from the hyacinth ponds is very clear and contains little total nitrogen. For the period June 1975 through January 1976, the average influent to the ponds contained 19 mg/liter BOD5, 70 mg/liter COD, 40 mg/liter total suspended solids, 1.3 mg/liter ammonia, and 14.7 mg/liter phosphate. During the same period, the average total suspended solids, less than 0.1 mg/liter ammonia, and 11 mg/liter phosphate. If the biomass produced in the hyacinth ponds is extrapolated to a one acre basis, then one acre would support a standing crop of an estimated 240 tons wet weight, or 12 tons dry weight and contain an estimated 4,500 pounds of mineral salts, 1,800 pounds of protein, and 16,800 pounds of carbohydrate. (Orr-FIRL)
W76-09437

SEWAGE TREATMENT FACILITY TO BE UPDATED AND EXPANDED AT KITCHENER ONTARIO,
Water and Pollution Control, Vol. 114, No. 1, p 23, January, 1976.

Descriptors: *Sewage treatment, *Treatment facilities, *Activated sludge, Sewers, Equipment, Aeration, Sludge treatment, Chlorination, Construction, Lagoons, Canada, *Waste water treatment.
Identifiers: Treatment facility upgrading, Ontario(Canada).

An extension to the Kitchener Pollution Control Centre facility, Ontario is described, which will bring the rated capacity of the plant from 11.5 million Igpd to 27 million Igpd. The facility is a conventional activated sludge plant with some original units that were built in the middle 1930's. Updating of the plant includes the building of a new overhead trunk sewer to bring raw sewage to the new plant; the demolition of the screen house and its replacement with a new screen and detritor building, capable of treating a peak flow of 43 million Igpd; and the upgrading of primary clarifiers, aeration units, and secondary clarifier units. New tanks are being designed for sludge treatment to mix and heat sludge with hydraulic gas guns. In addition, a new chlorine contact chamber is being added, which will provide a total detention time of 15 minutes a peak load. Other remodelling includes the replacement of the old boiler, the modification of the filter building to incorporate electrical and mechanical workshops, and the replacement of the present sludge lagoon area with a new sludge lagoon. (Kramer-FIRL)
W76-09439

WEED HOLDS PROMISE FOR POLLUTION CLEANUP,
C. Murray.
Chemical and Engineering News, Vol. 54, No. 12, p 23-24, March 22, 1976.

Descriptors: *Sewage treatment, *Waste water treatment, *Water hyacinth, Aquatic plants, Floating plants, Biological treatment, Lagoons, Aquatic weeds, Absorption.

The water hyacinth is being tested as a means of sewage treatment for small towns which can not afford the capital investment necessary with conventional treatment techniques. The water hyacinth is a vascular plant containing a system of vessels that transport nutrients from the roots through the leaves while absorbing large quantities of nutrients and pollutants found in domestic sewage. The hyacinth also has the ability to concentrate heavy metals and organic substances often present in industrial wastes. National Aeronautics and Space Administration (NASA) officials have been conducting research at Bay St.

Louis, Mississippi. In the spring of 1975, three acres of a 40-acre municipal lagoon that receives raw sewage from about 6000 households was planted with water hyacinths. Although three acres was insufficient to clean up the entire lagoon, planting 12 acres of the lagoon with hyacinths in summer of 1976 is expected to produce clean water in the lagoon. Uses for water hyacinths produced are also being explored. In a study at the Mississippi State University agricultural experiment station, hyacinths grown in municipal sewage were dried, ground into meal, and added to cattle feed. The hyacinth meal is high in minerals and protein and comparable to cottonseed meal or soybean meal as a feed supplement. NASA is researching the conversion of water hyacinths into methane by anaerobic fermentation. Residue produced by anaerobic digestion is an efficient fertilizer and soil conditioner. (Orr-FIRL)
W76-09440

CARBON WASTEWATER TREATMENT PROCESS,
Jet Propulsion Lab., Pasadena, Calif.
M. F. Humphrey, W. L. Dowler, and G. M. Simmons.
Public Works, Vol. 107, No. 2, p 62-63, February, 1976. 1 fig.

Descriptors: *Waste disposal, *Sewage sludge, *Recycling, *Activated carbon, Methane, Adsorption, Solids removal, *Waste water treatment.

It formerly was considered cheapest to dispose of sewage sludge. Now sludge can be recycled, producing methane and an activated carbon, used to purify more waste water. Many new processes use activated carbon to absorb contamination with or without chemical coagulating agents. In this new process, after the carbon adsorbs dissolved solids from water, it is recycled back into the untreated sewage and removed along with the sludge. Critical aspects of the process include using primary sludge solids to produce adsorbent carbon char and using it for promoting separation of suspended and settleable solids. After preliminary laboratory investigations of these steps and using the carbon char for removing dissolved solids, a pilot plant was designed, constructed, and placed in operation. The process involves absorbing most of the liquid wastes with the ash and carbon, and drying the mixture more completely and faster than is done in other processes, without adding any chemical agent. The pilot-plant demonstrated the potential to meet or exceed the federal and state requirements for water-disposal quality. Economic studies in progress indicate higher effluent qualities at costs competitive to those of conventional biological processes. (Snyder-FIRL)
W76-09441

COTTONVALLEY -- BRITAIN'S LATEST SEWAGE WORKS.
Water Services, Vol. 80, No. 959, p 49, 51, January, 1976.

Descriptors: *Sewage treatment, *Treatment facilities, Tertiary treatment, Methane, Incineration, Sludge treatment, *Waste water treatment.

The Cottonvalley Sewage Works, now under construction to serve all the needs of the new city of Milton Keynes, is designed to the same standards as other parts of the city as an integral part of the area. The works are expected to eventually serve a population of 275,000, including another town and surrounding villages, and will probably be completed by 1990. The Cottonvalley scheme is believed to be one of the most advanced purification works of its type anywhere in the world. The first of the three phases, designed to serve a population of 117,000, is nearing completion. Methane gas from sludge digestion is the main fuel for the two boilers and the sludge incinerator. When the incinerator is in use, heat from its waste gases is recovered by a heat exchanger for sludge digestion, heating domestic hot water, and space heating; at other times, these functions are assumed by the boilers. Administrative and laboratory areas are air conditioned. Building service are pneumatically controlled from a central panel. (Snyder-FIRL)
W76-09442

SLUDGE/ACTIVATED CARBON CYCLE TREATS SEWAGE.
Industrial Research, p 30, 33, January, 1976. 1 fig.

Descriptors: *Pilot plants, *Activated carbon, *Activated sludge, Recycling, California, *Waste water treatment.
Identifiers: *Pyrolysis.

If a pilot plant achieves projected 25% savings in costs, a new concept in technology for sewage treatment could be extensively used in treatment plants. A pyrolysis unit to manufacture activated carbon, for which sewage solids made a very good raw material, led to the use of the activated carbon produced to further treat waste water. This approach solves a problem common to most municipal sewage plants providing only primary treatment. The new process makes the solids that are normally difficult to dispose of into activated carbon, which is recycled with new solids and reactivated after use. Comparison studies found rotary calciners to be the best approach for the pyrolytic reactor. Data from a pilot plant test were used in designing the calciner being prepared for a million-gallon-a-day pilot plant at Huntington Beach, California. A gas drier is included to take exhaust gases from the burners to a flash drier to dry the filter cake before it goes into the calciner. (Snyder-FIRL)
W76-09443

CRAWLEY SEWAGE TREATMENT WORKS.
Water Services, Vol. 80, No. 959, p 39, January, 1976. 1 tab.

Descriptors: *Tertiary treatment, *Treatment facilities, *Sewage treatment, Biochemical oxygen demand, Suspended solids, Filtration, *Waste water treatment.

A plant for tertiary treatment is operating successfully at Tinsley Green. The treatment works, located near Crawley, was formerly under the control of the Crawley Urban District and now comes within the Thames Water Authority. The ever increasing demands on the original plant made it necessary for further extensions to be built; the tertiary treatment incorporates six gravity filters with equipment for automatic operation. The tertiary treatment plant was designed for dry weather flow of 23.64 million liters per day and peak flow of twice that amount. It was designed to treat sewage effluent already treated to the standards of the Royal Commission to under 10.0 ppm suspended solids and 5 day biochemical oxygen demand (BOD) in summer and under 15.0 ppm in winter. The influent and the final treated effluent were tested during mid 1974; the standards were met. Equipment for sequence control and automatic filter washing was designed to allow automatic washing of the filters when either a predetermined head loss through the filter occurred or a predetermined filter run terminated. (Snyder-FIRL)
W76-09444

OZONE PROVIDES ALTERNATIVE FOR SECONDARY EFFLUENT DISINFECTION. PART 1,
Welsbach Ozone Systems Corporation, Philadelphia, Pa.
C. Nebel, R. D. Gottschling, P. C. Unangst, H. J. O'Neill, and G. V. Zintel.
Water and Sewage Works, Vol. 123, No. 4, p 76-78, April, 1976. 7 fig.

Descriptors: *Sewage treatment, *Disinfection, *Ozone, *Waste water treatment, Tertiary treatment, Treatment facilities, Bacteria, Design criteria, Activated sludge.

Previous work has established that the effectiveness of ozone in secondary sewage effluent disinfection can be considered at several dosage levels. This study investigated the dosages of ozone required for disinfection in order to determine the effectiveness of removal of specific contaminants in the effluent. Secondary effluents were obtained from three types of sewage treatment plants in New Jersey and Pennsylvania--standard activated sludge, contact stabilization, and pilot plant oxygen enriched activated sludge Effluents were ozonized in a 6.5 inch I.D. Plexiglas ozone contact column. Samples were removed at specified times and analyzed for contaminant concentration. The amount of ozone required was found to vary, depending on the exact nature of the effluent. Data showed that the existence of ozone reaction products may be correlated to bacterial kill. A peroxide residual may be calculated as a quasi ozone residual, and may be used for the automatic control of an ozone disinfection system in an application similar to that of the chlorine residual method. (Kramer-FIRL)
W76-09445

WORKING TOWARDS TOUGHER ODOUR CONTROL STANDARDS.
For primary bibliographic entry see Field 5G.
W76-09446

DESERT AREA ACTIVATED SLUDGE PLANT.
Public Works, Vol. 107, No. 2, p 86, February, 1976.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, Slude treatment, Chlorination, Equipment.
Identifiers: Wet air oxidation.

The Indio, California, waste water treatment plant in the Southern California desert serves a population of 25,000 and industry. It includes primary and secondary settling, conventional activated sludge treatment, wet air oxidation of sludge, and chlorination. Diffused air aeration is important to proper operation of the activated sludge treatment process and, due to the high ambient temperatures, capability of the air compressor is more important than is usually true. Peak temperatures require higher air volumes. Two centrifugal blowers for normal operation are powered by electricity, and a third, which serves as a standby, is powered by an engine fueled by natural gas. The only unusual difficulties in nearly 2 yr of operation have been occasional sand storms that cause some problems in the lines. (Snyder-FIRL)
W76-09447

A COMPARISON BETWEEN THE EFFICACY OF SUBMARINE OUTFALL DISPOSAL OF ADVANCED PRIMARY EFFLUENT AND CONVENTIONAL TREATMENT,
Trieste Univ. (Italy). Istituto di Idraulica e Costruzioni Idrauliche.
For primary bibliographic entry see Field 5E.
W76-09448

OBJECTIVES AND COSTS OF ADVANCED TREATMENT TECHNIQUES FOR SEWAGE,
Balfour (D.) and Sons, London (England).
G. A. Truesdale, and M. R. G. Taylor.
Berichte der Abwassertechnischen Vereinigung e.V., No. 28, p. 323-332, 1976. 1 fig, 24 ref.

Descriptors: *Waste water treatment, *Tertiary treatment, *Irrigations, *Lagoons, Filtration, Costs, Nitrification, Denitrification, Chemical precipitation, Activated carbon, Ion exchange, Electrodialysis, Reverse osmosis, *Sewage treatment, *Operating costs.

Identifiers: Microstraining.

The uses of the receiving watercourse largely determine effluent standards. Controling discharges of suspended solids and oxygen consuming matter is fundametally important. Tertiary treatment is used to meet more stringent standards. Irrigation over grassland is such a process; effluent is allowed to flow over graded land with a gentle slope, then collected. Lagoons are another such method; deeper lagoons with longer retention times are more effective. Slow filtration through sand is suitable for small works. Rapid sand filtration uses thicker layers of sand, and the liquid may flow either up or down. Microstraining forces effluent through a cylindrical surface of stainless steel fabric, in which solids collect. In gravel bed clarifiers, effluent flows upward through a shallow gravel bed. A suitable tertiary treatment process can achieve effluent standards of 10:10. Percolating filters operating at relatively low biochemical oxygen demand (BOD) loadings normally achieve a high a degree of nitrification for ammonia removal. Biological nitrification followed by denitrification seems most promising for removing nitrogen in the form of nitrate. Alum, lime, or iron salts can remove phosphate by precipitation, either during primary treatment or as a tertiary process. Biological methods can produce effluents with 5 mg/liter BOD, suspended solids, and ammonical nitrogen, but could probably not meet more stringent standards. Activated carbon adsorption can remove residual organic matter, but not inorganic constituents. Ion exchange usually requires activated carbon pretreatment to remove organic matter, as would electrodialysis. Adding acid to sewage effluent minimizes problems posed by reverse osmosis. Much of the data on costs of these processes is based on limited operating experience. (Snyder-FIRL)
W76-09449

CARBON MADE FROM SEWAGE SOLIDS TREATS WASTEWATER.
Water and Pollution Control, Vol. 114, No. 1, p 31, January, 1976.

Descriptors: *Waste water treatment, *Activated carbon, *Pilot plants, *Sewage treatment, Suspended solids, Heavy metals, Odor, Treatment facilities.
Identifiers: *Pyrolysis, Sewage solids, Activated carbon manufacture.

A pilot plant is being constructed to test a system that uses a pyrolytic reactor for converting solid sewage materials into activated carbon, which then is used to treat incoming waste water. A mobile demonstration unit operated successfully at the sewage treatment plant at Huntington Beach, California, where the pilot plant will be installed. The system, as tested with the mobile unit, virtually eliminated sewage solids, delivered cleaner waste water to the ocean, removed heavy metals from the sewage, and eliminated odors. Design parameters will be determined by the pilot plant for larger facilities processing sewage to meet pending United States envionmental standards. The origin of the process was a pyrolysis unit to manufacture activated carbon. Later it was found that sewage solids were a very good raw material, and the resulting product was suitable for further treatment of sewage. After treating the waste water, activated carbon is recycled with the new sewage solids and reactivated. Eventual extraction of some ash and carbon from the process represents the system's only residue. (Snyder-FIRL)
W76-09450

NITRATES: WHAT'S HAPPENING IN BRITAIN,
Thames Water Authority, London (England).
W. Ray.
Water and Wastes Engineering, Vol. 13, No. 4, p 26-28, 30, 48, April, 1976. 3 fig.

Descriptors: *Nitrogen compounds, *Nitrates, *Denitrification, *Waste water treatment, Activated sludge, Treatment facilities, Nutrient removal, Bacteria.
Identifiers: Facultative heterotrophic bacteria.

Demand for water has increased, resulting in increased use of water from rivers. Increased detergent use and improved techniques for sewage treatment which oxidize ammonia are partially responsible for increases in phosphate and nitrate concentrations in natural waters. The major source, however, is agricultural fertilizer run-off. Nitrates cause most concern in the River Lee, an important tributary of the River Thames. Measures were taken to reduce the nitrate level in the effluent of a major sewage treatment works on the River Lee, at Rye Meads North of London. Laboratory work indicated that an anoxic zone in activated sludge plants could reduce the nitrogen concentration in the final effluent by about 40% under the proper conditions. Plant scale experiments are in progress. Attempts to create an anoxic zone by removing 75% of the diffusers to reduce air action to a level preventing settling were not entirely satisfactory; either some settlement occurred or a slightly greater air flow inhibited anoxic conditions. Substituting a stirring mechanism for the diffusers reduced nitrate from 29 mg/liter to 16 mg/liter in the final effluent. The original design of a new works at Borden, south of London, included denitrification based on these methods. Another new plant being constructed in the River Blackwater Valley near Farnborough provides in its original design for introducing settled sewage upstream of the aerators, creating a zone facilitating denitrification. Both methods are based on nitrate as an oxygen source for various facultative heterotrophic bacteria. Methanol was studied experimentally as a source of carbon for the biological process at Lee Bridge. Nitrate removal rates were consistently 70% to 90%. A new ion exchange process, using heated influent rather than an acid or base solution has been studied but not used commercially. (Snyder-FIRL)
W76-09451

PCS USES STUDY APPROACH FOR EFFLUENT TREATMENT.
Chemical Age, Vol. 112, No. 2950, p 15, January 30, 1976. 1 fig.

Descriptors: *Waste water treatment, *Treatment facilities, Biological treatment, Filtration, Flotation, Sanitary engineering, Bubbles.
Identifiers: Deep Shaft Process, Microflotation.

Pollution Control Systems (PCS) builds effluent plants, provides technical assistance, and studies the economics of treating effluent and recovering materials. PCS uses a set method in approaching effluent problems. First a study involving both field work and analysis is conducted, technically assessing the scale and nature of the problem. A process design team then considers hydraulic levels, pollution levels, and required discharge standards, and proposes a treatment system. Various products for low rate filtration and biofiltration and two treatment systems are currently available from the company. A deep shaft process was developed for biologically treating biodegradable industrial effluent or sewage. It supplies air more efficiently to micro-organisms, significantly increasing treatment rates. The microflotation process, licensed to PCS, couples the benefits from chemical flocculation technology and a simple air bubble generation method for removing suspended solids by flotation. First, oversized solids are removed, the effluent pH is adjusted, and any chemical precipitants required are added. Hydrostatic pressure dissolves air which is injected, aerating the effluent. Reduced hydrostatic pressure later releases the dissolved air as microscopic bubbles which float the stream's solid particles, to which they attach themselves, to the surface. (Snyder-FIRL)
W76-09452

NITRIFICATION STUDIES OF SHIP CHANNEL WATERS,
Texas Univ. at Arlington, Dept. of Civil Engineering.
Y. T. Hung, and W. W. Eckenfelder, Jr.
Water and Pollution Control, Vol. 114, No. 4, p 8-9, 11, 46-47, April, 1976. 4 fig, 2 tab, 5 ref.

Descriptors: *Nitrification, Rivers, Flow, Waste assimilative capacity, Self-purification, Nitrates, Nitrites, Dissolved oxygen, Nitrogen compounds, Texas, Channels, Channel flow.
Identifiers: *Houston Ship Channel(Texas).

A study was conducted on the Houston Ship Channel water to determine the nitrification of channel water samples and the effects of channel flow and degree of treatment on the nitrification process under simulated laboratory conditions. Houston Ship Channel water from various depths was aerated in the laboratory for 20 days and sampled every few days for nitrate and nitrite analysis. Simulation was performed by adding fresh water and waste water to a drum in proportion to the flow in the channel, and sampling before and after each input. Nitrification was not observed in the Houston Ship Channel waters at station Mile 10, the sampling location. This situation might be caused by the absence of dissolved oxygen in the channel waters. Nitrification of water samples taken in August at the same location started on the 12th day of aeration in the laboratory, with a nitrogenous biochemical oxygen demand (BOD) of 9.1 mg/liter. For samples taken in September, nitrification started between the 3rd and 7th days of aeration with a nitrogenous BOD of 0.7 to 1.8 mg/liter. The simulation seems to indicate that the degree of waste treatment increases nitrification, whereas the increase in channel water flow leads to a lesser extent of nitrification. (Snyder-FIRL)
W76-09453

THE WATER INDUSTRY: A REVIEW RELATING TO WASTE WATER TREATMENT,
M. A. Kershaw.
Process Biochemistry, Vol. 11, No. 2, p 37-39, 44, March, 1976. 14 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Tertiary treatment, Ion exchange, Electrodialysis, Reverse osmosis, Fertilizer, Treatment facilities.

The Water Resources Act of 1973 restructured water services in England and Wales to meet increasing demands for water, improve quality of effluent discharges, and protect fisheries and water amenities. In April 1974, 10 regional water authorities replaced 1600 separate bodies. Clean rivers and augmented water supply both depend on sewage and effluent treatment. Many of the actual sewage works inherited from local authorities were grossly overloaded and had worn out equipment. Because of this situation, research on improved waste water treatment is being conducted with a sense of urgency. Continuous monitoring of the stages of waste water treatment is emphasized because of the danger to fish posed by instantaneous discharges. Attempts are also being made to link weather conditions more closely with water treatment. There are many variations in sewage treatment processes, including small prepackaged units. In many instances increasing pressures for improved effluent quality require further stages of treatment, tertiary treatment for effluents already of good quality or advanced treatment, beyond the traditional methods. Advanced treatment methods usually involve further removal of suspended solids, chemical treatment, and removal of organic materials with activated carbon. Methods for removing dissolved salts include ion exchange, electrodialysis, and reverse osmosis. Well-digested sludge that does not contain residual heavy metals can be used as agricultural fertilizer. Automatic control is being used increasingly for routine operations. In some cases, industrial wastes are being recycled into new products. (Snyder-FIRL)

W76-09454

SOLUTION OF THE OPERATING PROBLEMS OF A MODERN SEWAGE TREATMENT PLANT,
J. Finch.
Berichte der Abwassertechnischen Vereinigung e.V., No. 28, p 207-214, 1976.

Descriptors: *Waste water treatment, *Treatment facilities, *Sewage treatment, Aeration, Sludge digestion, *Operations, Performance.

Possible solutions to various water pollution control problems were introduced into a modern sewage treatment plant at Slough, Great Britain, with very satisfactory operational characteristics. The plant uses reinforced fiberglass in the settling tank outlet trough/weirs. An aeration tank with a dynamic baffle-wall performed very similarly to a conventional tank, but cost less to construct. The floating roof type heated sludge digestion tanks were improved by installing a high-density polyethylene pipe line along the peripheral walkway at the top of the tank and blowing gas through spargers inserted between the floating roof and the digester sidewall. Partially dewatered sludge from the heated digestion plant, containing appreciable quantities of phosphorus and nitrogen, is used to fertilize grassland on which beef cattle are grazed. Sludge, soils, crops, and animals are monitored. The increasing demand for water requires improved quality of effluents discharged into rivers. In one instance, improved treatment was achieved by spreading the release of an industrial effluent into the sewage system over a longer period of time. Primary settlement may also achieve a good deal of balancing at the treatment plant. However, there has been little study of incorporating balancing into treatment plant operation. The Slough plant is essentially a high-rate surface aeration unit followed by nitrifying biological filters. It incorporates balancing by extended use of augmented existing storm water tanks to cut off peak flows and store and return them to fill in troughs at low flow. It is easier, more satisfactory, and less expensive to build automation into a process involving balancing. (Snyder-FIRL)
W76-09455

ACTIVATED SLUDGE PROCESS WITH ALUM ADDITION AND HEAT TREATMENT,
Gannett Fleming Corddry and Carpenter, Inc., Harrisburg, Pa.
A. C. Gray, Jr., H. B. Gerber, and P. E. Paul.
Journal Water Pollution Control Federation, Vol. 48, No. 1, p 163-178, January, 1976. 9 fig, 7 tab, 12 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, Phosphorus, Nutrient removal, Sludge treatment, Polyelectrolytes, Dewatering, *Heat treatment.
Identifiers: *Alum, High-purity oxygen, Sludge conditioning.

Combined high-purity oxygen activated sludge, phosphorus removal by aluminum sulfate precipitation, and thermal conditioning all sludges were studied for Harrisburg, Pennsylvania. Separate on-site pilot systems were used for the oxygen activated sludge and thermal conditioning processes. Treated primary effluent from existing facilities by high-purity oxygen activated sludge, under 2.0 hr aeration time produced 20 mg/liter effluent biochemical oxygen demand (BOD) concentration, even during storm loadings. At 0.5 lb BOD/day lb mixed liquor suspended solids (SS) biomass loading, 1.08 lb total solids/lb BOD removed were produced. An average 1.31 lb oxygen were consumed/lb BOD removed. Solids production varied directly and oxygen consumption inversely with biomass loading. Phosphate was removed to effluent concentrations of 6.0 mg/liter total and 3.0 mg/liter soluble phosphate with aluminum sulfate. About 1.8 mole aluminum ions/mole phosphorus was the optimum dosage, equivalent to adding about 5.6 lb alum/lb influent phosphate. It is necessary to acclimate the biological system to the alum, or the effluent phosphate will increase due to the SS increase. Mean SS concentrations in the effluent were 20 mg/liter before chemical addition at rates of clarifier surface loading between 641 and 694 gal/day/sq ft. Effluent SS increased and observable pin floc formed in the final clarifier after alum addition. For this reason the final design includes polyelectrolyte addition. Thermally conditioning combined sludge increased dewaterability. Filter yields between 3 and 9 lb/day/sq ft and optimum dewatering were compatible. Decant liquor from thermal sludge conditioning did not change effluent quality. While the pilot plant operated, up to 30% of the oxygenation tank's BOD loading was recycled decant liquor. Recycled liquor will probably account for between 10 and 15% of the BOD loading to the oxygenation tanks in the full-scale system. (Snyder-FIRL)
W76-09456

SOME CRITICAL VIEWS OF SELECTED PROCESSES FOR THE BIOLOGICAL TREATMENT OF SEWAGE,
H. J. Schmidt-Holthausen.
Process Biochemistry, Vol. 11, No. 2, p 27-30, March, 1976. 4 fig.

Descriptors: *Activated sludge, Treatment facilities, *Aeration, *Waste water treatment, Oxygen, Bubbles, *Biological treatment, *Sewage treatment.
Identifiers: Aerators, UNOX, Bioxon, Marox, Lindox, High-purity oxygen.

Although the aerated sludge process always uses an aeration tank followed by a final settling tank, there are many variations in the way in which sewage, oxygen, and activated sludge are brought into contact. In two process methods, raw sewage and activated sludge are completely and immediately mixed throughout the tank. One of these uses fine bubble aeration, while the other uses surface aerators. The piston flow feed method also provides complete mixing, but sludge loading decreases and oxygen concentration increases in the direction of flow. Another method feeds return sludge at the inlet end of the tank and sewage and sludge along the lateral sides. The Bioxon process includes incremental sewage feed and tapered feed of air along the lateral sides of the aeration tank. Activated return sludge is fed at the inlet end, resulting in a very high concentration of solids at the front of the tank. This high concentration leads to increased biological activity and metabolism, requiring an increased oxygen demand which is met by tapered aeration. Pure oxygen has been used for aeration in pilot plants. The advantages of using pure oxygen are offset by the disadvantages. The three main methods of using pure oxygen include the Marox process, which uses very fine bubbles and an open tank. The Unox process uses several tanks, and feeds the oxygen from the gas space above one tank to the next tank. The Lindox process uses a blower to recirculate oxygen not used. The most suitable activated sludge process must be selected for each application. (Snyder-FIRL)
W76-09457

REMOVAL OF PHOSPHATE FROM WASTE WATER,
Rockwell International Corp., El Segundo, Calif. (Assignee).
E. V. Kleber, and H. L. Recht.
United States Patent 3,956,118. Issued May 11, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 2, p 728-729, May 11, 1976. 1 fig.

Descriptors: *Waste water treatment, *Chemical precipitation, *Patents, *Phosphates, *Anions, Chemical wastes, Cations, Chemical reactions, Separation techniques, Treatment facilities.
Identifiers: Rare earth cations, Anion removal.

A patent for a chemical treatment process which removes phosphate-containing anions from waste water is presented. The process involves adding a trivalent rare earth cation in soluble form to the waste water to form an insoluble rare earth precipitate of the trivalent rare earth cation and the phosphate-containing anions in the waste water. This precipitate is then separated from the waste water. (Kreager-FIRL)
W76-09458

POLYETHYLENE PIPE INSERTION REHABILITATES OLD SEWERS,
Freeport Public Works, N. Y.
For primary bibliographic entry see Field 8G.
W76-09459

SEWER INSPECTION: CHECKING IT OUT,
For primary bibliographic entry see Field 8G.
W76-09460

GIVE STORMWATER POLLUTANTS THE SPIN,
Municipal Environmental Research Lab., Edison, N.J. Storm and Combined Sewer Section.
R. I. Field, P. E. Moffa, and J. M. Karanik.
The American City and County, Vol. 91, No. 4, p 77-78, April, 1976. 2 fig, 1 tab.

Descriptors: *Sewerage, *Waste water treatment, *Overflow, *Combined sewers, Storm water, Storm runoff, Flow measurement, Flotation.

A simple swirl regulator controls combined sewer overflows for a Syracuse residential complex, concentrating and retaining waste water solids while diverting excess storm water away from the treatment plant. During dry weather, when the flow is below the downstream capacity of the interceptor, a pump conveys the entire flow to the treatment plant. A flowmeter deactivates the pump when the flow exceeds this capacity. The waste water then flows by gravity through the swirl chamber, which diverts the storm water in excess of the treatment capacity. The system reduces settleable solids and floatables over a wide range of overflow rates. Biochemical oxygen demand (BOD) removals greater than 50% and grit reductions up to 90% are achieved. The pump used for dry weather flows would not be necessary in an ideal installation. During overflows, floatables are contained by the scum ring in the outer ring of the chamber and forced into a floatables trap. During subsequent dry weather, they are drawn down and removed. (Snyder-FIRL)
W76-09461

GRP LAUNDERS AT SEWAGE TREATMENT PLANT.
For primary bibliographic entry see Field 8G.
W76-09462

SUMMARY OF MUNICIPAL WATERSHED MANAGEMENT SURVEYS IN EASTERN UNITED STATES,
Southeastern Area State and Private Forestry, Atlanta, Ga.
For primary bibliographic entry see Field 4D.
W76-09466

NEW TECHNOLOGIES IN WATER PURIFICATION AND THEIR APPLICATION TO ARID LANDS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 3A.
W76-09481

OPTIMAL GROUND WATER QUALITY MANAGEMENT: WELL INJECTION OF WASTE WATERS,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
R. Willis.
Water Resources Research, Vol. 12, No. 1, p 47-53, February, 1976, 2 fig, 3 tab, 24 ref.

Descriptors: *Mathematical models, *Aquifers, *Waste water treatment, *Water quality, Water treatment, Cost-benefit analysis, Groundwater, *Injection wells.
Identifiers: *Groundwater quality and quantity model, Minimized surface waste treatment cost.

A mathematical model for optimal conjuctive utilization of the ground water quality and quantity resources of unconfined aquifers was constructed. The saturated zone of the ground water system was considered a component of a regional waste treatment system. The model was designed so as to minimize the cost of surface waste treatment while maintaining acceptable water quality levels throughout the aquifer. Results indicate the feasibility of using secondary waste water treatment (trickling filter) in conjunction with the assimilation capacity of the unconfined aquifer for waste water degradation and disposal. (Heiss-NWWA)
W76-09511

RADIATION FOR A CLEAN ENVIRONMENT.
International Atomic Energy Agency, Vienna (Austria).
STI/PUB/402, Proceedings of a symposium held in Munich on March 17-21, 1975. 672 p.

Descriptors: *Environmental sanitation, *Waste water treatment, Sewage treatment, Sludge, *Radiation, Recycling, Pollutants, Economics, Pilot plants, *Conferences, *Water reuse.

The symposium was sponsored by the IAEA in cooperation with the Government of the Federal Republic of Germany and the Bayerische Landesanstalt fur Bodenkultur und Pflanzenbau. Forty eight papers were presented in eight sessios covering the current technology of waste-water treatment and re-use, radiosensitivity of micro-organisms, disinfection and micro-biological control, physical and chemical modification of aqueous pollutants, technological and economic aspects, pilot plant design and operating experience and radiation of non-liquid wastes. In a panel session the previous sessions were summarized and discussed. (See also W76-09513 thru W76-09556) (Chilton-ORNL)
W76-09512

TYPES AND TREATMENT OF SEWAGE SLUDGES PRACTICE IN THE FEDERAL REPUBLIC OF GERMANY,
Stuttgart Univ. (West Germany). Institut fuer Siedlungswasserbau und Wassergute-wirtschaft.
M. O. Tabasaran.
In: Radiation for a Clean Environment, Proceedings of a Symposium held at Munich, March 17-21, 1975. IAEA-SM-194/101, p 3-18, 3 fig, 2 tab.

Descriptors: *Sewage disposal, *Environmental sanitation, *Sewage treatment, Sludge treatment, Anaerobic digestion, Bacteria, Drying, Inhibitors, *Waste water treatment, *Sewage sludge.
Identifiers: *Germany.

Sewage treatment plants produce sludge which contains small amounts of solids in large amounts of water. The first step in the treatment of this sludge is a de-watering process. Several processes can be used to increase the solid content of the sludge from the usual 5 - 10%; gravity thickening increases to 15%, centrifuging or straining-band-pressing to 30%, and pressure-filtration to 40%. Drying produces an almost moisture free substance. Before de-watering, the sludge may be mixed with coagulating agents, or preheated, or its colloidal components biochemically oxidized. These processes accelerate de-watering. Sludge which is disposed of along with solid refuse in land fills should not be more than 60-70% moisture. Sludge which has been composted with a carbon carrier can be used as a soil improver. Anaerobic alkaline digestion of sludge is the most common process in use. (See also W76-09512) (Chilton-ORNL)
W76-09513

METHODS FOR REDUCING THE INFECTION HAZARD OF WASTE-WATER SLUDGE,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. B. Farrell, and G. Stern.
In: Radiation for a Clean Environment, Proceedings of a Symposium held in Munich, March 17-21, 1975. IAEA-SM-194/102, p19-28, 5 tab, 1 fig, 12 ref.

Descriptors: *Environmental sanitation, *Sludge treatment, Sewage treatment, Sewage disposal, Sludge, Waste water(Pollution), *Infection, Hazards, Irradiation, *Disinfection, *Waste water treatment, Waste water disposal.

The processes in use for stabilizing sludge include anaerobic or aerobic digestion and, for disposal procedures such as disposal to landfills, incineration or disposal to oceans, these processes may be adequate. About 25% of the sludge produced in the United States is used for agricultural purposes and this sludge requires further reduction in the numbers of infectious organisms. Methods for reducing infection hazards are pasteurization, long-term lagooning, thermophilic anaerobic digestion, thermophilic aerobic digestion, and high energy irradiation. The high energy radiation method has several advantages, mainly high reliability, but its greatest disadvantage is its high cost. (See also W76-09512) (Chilton-ORNL)
W76-09514

CURRENT TECHNOLOGY AND ADVANCES IN TRUE RE-USE OF EFFLUENTS,
National Inst. for Water Research, Pretoria (South Africa).
G. G. Cillie.
In: Radiation for a Clean Environment, Proceedings of a Symposium held in Munich, March 17-21, 1975. IAEA-SM-194/103. p 29-43, 7 fig, 8 ref.

Descriptors: *Environmental sanitation, *Water reuse, *Irradiation, Public health, Technology, Disinfection, Waste water treatment, Water treatment.

Water reclamation and re-use is a practical solution to water scarcity in most conditions if adequate precautions are taken in the design and operation of systems to protect public health. Reclaimed water may prove to be a safer and more reliable water supply than those of doubtful origin. Improved radiation technology can ensure complete sterilization and breakdown of organic radicals which may be potentially carcinogenic. The present high costs of radiation and unfavourable economics must be overcome by continuous improvement in nuclear technology. (See also W76-09512) (Chilton-ORNL)
W76-09515

PUBLIC HEALTH ASPECTS OF WASTE-WATER TREATMENT,
Royal Veterinary and Agricultural Coll., Copenhagen (Denmark). Dept. of Veterinary Virology and Immunology.
E. Lund.
In: Radiation for a Clean Environment, Proceedings of a Symposium held in Munich, March 17-21, 1975. LAEA-SM-194/104. p 45-60, 6 tab, 26 ref.

Descriptors: *Environmental sanitation, Waste water(Pollution), *Public health, *Waste water treatment, Pathogenic bacteria, Virusses, Enteric bacteria, Paratitism, Pathology, Disinfection.
Identifiers: Pasteurization.

Reviews are presented of the various bacteria, viruses and parasites found in waste water and polluted waters which are pathogenic to man and the conventional methods for the treatment of these waters. It is concluded that by conventional secondary biological treatment a waste-water may be obtained that contains a very reduced number of pathogens. Chlorination may almost eliminate the bacteria and also influence the amoeba cysts, but the enteric viruses and the parasite eggs are not influenced. In sludges, even after digestion, viruses, some bacteria, and parasite eggs may still be present. Pasteurization may render all these pathogens harmless. (See also W76-09512) (Chilton-ORNL)
W76-09516

RADIATION TREATMENT OF WASTES, A REVIEW,
Atomic Energy Research Establishment, Harwell (England).
F. S. Feates, and D. George.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. LAEA-SM-194/405. p 61-72, 57 ref.

Descriptors: *Environmental sanitation, *Waste treatment, *Irridation, *Reviews, *Ozone, Disinfection, Radiation, Industrial wastes, Sewage sludge.

It has been shown that radiation is effective in degrading organic matter in wastes, destroying pathogenic organisms, and enhancing the sedimentation and filterability of sludges but at an extremely high cost. Since 1973, changes in world energy supplies which affect economic assessments made previously and the environmental hazards of pollution are receiving increased attention so that existing technologies are being re-examined. Ozone produced by gamma-irradiation of air is being used as an alternative to chlorine for sterilization. Radiation presents a possible solution to specific problems associated with industrial wastes. A prototype plant for complete sterilization of sewage sludge in operation. It is seen that there is considerable scope for future work which could affect the economics of radiation treatment. (See also W76-09512) (Chilton-ORNL)
W76-09517

THE NEED FOR THE USE OF HIGH-LEVEL RADIATION IN WATER TREATMENT AND IN WASTE-WATER (SEWAGE) TREATMENT,
Aqueonics, Inc., Los Altos, Calif.
N. E. Nielson.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. LAEA-SM-194/602. p 73-82, 14 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, Water pollution, *Irradiation, Sewage treatment, Gamma rays, Disinfection, *Water treatment.

The need for use of radiation in water treatment is discussed in light of the fact that even after primary and secondary treatments and chemical disinfection, significant quantities of contaminants are still present in sewage. The paper points out that a great deal of energy is required in the use of known techniques for the removal of these contaminants and that a more complex set of conditions must be considered in effective water pollution elimination. Gamma radiation is identified as the most reliable cost-effective, generally efficient technique in the tertiary stages and that its effectiveness can be expanded with the addition of

select chemicals to increase the number of ionizations and/or to capitalize upon surface charge phenomena. (See also W76-09512) (Chilton-ORNL)
W76-09518

SURVEYS ON RADIATION-RESISTANT ASPOROGENIC BACTERIA IN NATURAL ENVIRONMENTS,
Tokyo Univ. (Japan). Lab. of Radiation Genetics.
For primary bibliographic entry see Field 5C.
W76-09519

VIRUSES AND IONIZING RADIATION IN RESPECT TO WASTE-WATER TREATMENT,
Massachusetts Institute of Technology, Cambridge, Massachusetts, Department of Nutritution and Food Science.
H. S. Lemke, and A. J. Sinskey.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. LAEA-SM-194/203. p 99-120, 7 tab, 8 fig, 73 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, *Radiation, *Viruses, Disinfection, *Ions.
Identifiers: *Ionizing radiation.

A survey is presented on viruses, the diseases they can cause in man, and the effects of ionizing radiation on viruses. In conclusion it was stated that ionizing radiation inactivates viruses by direct and indirect effects. The radiosensitive target is the nucleic acid and the degree of radiosensitivity is affected by temperature and the suspending menstruum. The role of oxygen in radiosensitization of viruses remains unclear. The effective application of radiation treatment of waste-waters requires information on the number of plaque-forming units per ml for dose determination. (See also W76-09512) (Chilton-ORNL)
W76-09520

DISINFECTION OF SLUDGE AND WASTE-WATER BY IRRADIATION WITH ELECTRONS OF LOW ACCELERATING VOLTAGE,
Polymer-Physik G.m.b.H., Co., Kg., Tuebingen (West Germany).
P. Holl, and H. Schneider.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/301. p 123-138, 7 fig, 8 tab, 9 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, *Irradiation, *Sludge treatment, Costs, Disinfection.
Identifiers: Low accelerating voltage, *Electron accelerator.

The use of natural ionizing radeation or electron radiation of high accelerating voltage has encountered some opposition because the radiation cannot be stopped, and the investment cost of electron accelerators having an accelerating voltage of more than 1 MV is very high. These disadvantages may be overcome by using an electron accelerator of low accelerating voltage. Agitation of the substrate during irradiation allows a thick layer of sludge to be irradiated. The advantages of this method are less costly radiation shielding, complete absorption of the radiated energy by the substrate, and low investment and operating cost. The sterilizing effect of the process is produced by secondary reactions that take place in the water in addition to the primary reactions. (See also W76-09512) (Chilton-ORNL)
W76-09521

BIOLOGICAL EFFECTS OF HIGH-ENERGY ELECTRON IRRADIATION OF MUNICIPAL SLUDGE,
Massachusetts Inst. of Tech. Cambridge.
For primary bibliographic entry see Field 5C.
W76-09522

TREATMENT OF SEWAGE SLUDGE WITH COMBINATIONS OF HEAT AND IONIZING RADIATION (THERMORADIATION),
Sandia Labs., Albuquerque, N. Mex.
H. D. Sivinski.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/303. p 151-167, 16 fig, 32 ref.

Descriptors: *Environmental sanitation, *Sewage treatment, *Sludge treatment, *Irradiation, Heat, Time, *Heat treatment, Waste treatment, Pathogenic bacteria.
Identifiers: *Thermoradiation, Synergism, Sewage pathogens.

This research deals with inactivation of sewage pathogens by means of heat and ionizing radiation (gamma) applied singly and thermoradiation, heat and ionizing radiation applied simultaneously. The data indicated treatment time at temperature can be reduced with ionizing radiation or radiation dose can be reduced significantly by adding heat. When thermoradiation combinations are properly chosen, synergism is observed with aerobic and anaerobic spores, vegetative cells, viruses and enzymes which can result in up to 30-fold reduction in treatment times. (See also W76-09512) (Chilton-ORNL)
W76-09523

SYNERGISTIC EFFECTS OF IRRADIATION OF WASTE-WATER.
Florida Inst. of Tech., Melbourne. Univ. Center for Pollution Research.
D. D. Woodbridge, P. C. Cooper, A. J. Van den Berg, H. D. Musselman, and H. N. Lowe.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/304. p 169-189, 20 fig, 2 tab, 10 ref. DAAK-02-71-C-0296.

Descriptors: *Environmental sanitation, *Waste water treatment, *Irradiation, Aqueous solutions, Bacteria, *Bactericides.
Identifiers: Synergism, Hydrated electron.

A mathematical/statistical analysis of the data indicates that irradiation kills bacteria more readily in a large aqueous environment than in a normal radiation chamber. These results can be best explaned by the creation of the hydrated electron which acts as a highly reactive negative ion. The reducing effects of this ion can account for many of the organic and inorganic reactions observed in aqueous solutions. Comparison of the effectiveness of irradiation on a solution of buffered distilled water containing bacteria and secondary effluent showed a shielding condition with the more turbid effluent. Small amounts of chlorine in the effluent appeared to produce a reduction in the effectiveness of the irradiation but large doses of chlorine produced a definite synergistic effect. (See also W76-09512) (Chilton-ORNL)
W76-09524

GAMMA IRRADIATION FOR SEWAGE TREATMENT AT US ARMY FACILITIES,
Army Facilities Engineering Support Agency, Fort Belvoir, Va. Research and Technology Div.
A. J. Van den Berg, H. D. Hollis, H. D. Musselman, H. Lowe, and D. D. Woodbridge.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/305. p 191-196, 12 ref.

Descriptors: *Environmental sanitation, *Sewage treatment, *Irradiation, Radioisotopes, Gamma rays.
Identifiers: *Synergism, Electron accelerators.

Initial investigations in the laboratory assessed the effects of gamma radiation from a cobalt-60 source on fecal coliform, M-pyogenes and M-smematis organisms and on such common constituents of sewage as phenol, surfactants, and pesticides. Current research uses effluent from a municipal sewage plant and substitutes fecal streptococcus for M-smegmatis as a test organism. The previously noted synergistic effect of chlorine was achieved only in the presence of relatively large concentrations of chlorine at tthe time of irradiation. The work is directed toward the effects of gamma irradiation alone and in combination with chlorine and oxygen on sewage sludge and on the cyst stage of protozoa. High-energy radiation from isotopic sources or from electrically powered accelerators would be equally effective but isotopic sources are recommended for installations the size of US Army posts. (See also W76-09512) (Chilton-ORNL)
W76-09525

SCOPE FOR UTILIZING GAMMA RADIATION FOR MICROBIOLOGICAL CONTROL OF SEWAGE WASTE-WATER IN INDIA,
Bhabha Atomic Research Centre, Bombay (India). Biochemistry and Food Technology Div.
N. F. Lewis.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/307. p 197-202, 1 tab, 2 fig, 10 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, *Irradiation, Agriculture, Gamma rays, Sewage treatment, Water reuse.
Identifiers: *India.

In sewage treatment plants in India, conventional methods of treatment are used, the secondary effluent is emptied into the sea or, after treatment with chlorine, may be used for land irrigation. However, these methods do not adequately render the effluent safe for agricultural use. The secondary effluent has a comparatively low microbial count and preliminary studies indicate that radiation doses in the range of 0.1-0.3 Mrad would suffice for elimination of pathogens. The dose of radiation required can be reduced several fold if irradiation is carried out in the presence of certain chemicals. (See also W76-09512) (Chilton-ORNL)
W76-09526

SANITARY EFFECT OF GAMMA IRRADIATION ON SEWAGE SLUDGE,
Zurich Univ. (Switzerland). Veterinary Bacteriological Inst.
E. Hess, and C. Breer.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/308. p 203-308, 4 fig.

Descriptors: *Environmental sanitation, Sewage treatment, Irradiation, *Pathogenic bacteria, *Salmonella, Bacteria, Sewage sludge, Gamma rays, Enteric bacteria.
Identifiers: Pasteurization.

It was found that neither aerobic stabilization nor anaerobic digestion significantly reduced sludge contamination with Salmonellae which was present in more than 90% of the samples. Salmonellae in sewage sludge spread on grass survived up to 72 weeks. In a model experiment of the sanitary effect of pasteurization and gamma irradiation, 259 samples from 44 different sewage disposal plants were examined. A linear reduction of Enterobacteria was found with increasing doses of gamma radiation. The sanitary effect of gamma irradiation with 300-350 krad was equivalent to the effect of heat treatment by pasteurization. (See also W76-09512) (Chilton-ORNL)
W76-09527

DATA ON THE DISINFECTION OF LIQUID MANURE BY GAMMA IRRADIATION AT BAJA, HUNGARY,
Veterinary Sciences Univ., Budapest (Hungary).
J. Simon, and G. Tamasi.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/306. p 209-216, 2 fig, 2 tab, 13 ref.

Descriptors: *Waste treatment, *Farm wastes, *Irradiation, Aerobic bacteria, Anaerobic bacteria, Salmonella, Clostridium, *Disinfection,
Identifiers: Radiosterilization, *Hungary.

The disinfection of liquid manure by gamma irradiation was investigated. Aeration of the sample did not increase the effectiveness of the radiosterilization treatment. No great differences were observed in the radiosensitivity of the aerobic and anaerobic microbes. Aerobic spores were more sensitive than the vegetative Clostridia. Relatively low radiation doses were needed to eliminate Salmonellae in liquid manure. Gamma sterilization cannot be used as a practical operation against Mycobacteria because too high radiation doses are needed for the total elimination of these micro-organisms. (See also W76-09512) (Chilton-ORNL)
W76-09528

AQUEOUS RADIATION CHEMISTRY IN RELATION TO WASTE TREATMENT, AN INTRODUCTORY REVIEW,
Edgenoessische Technische Hochschule, Zurich (Switzerland). Inst. for Aquatic Sciences and Water Pollution Control.
J. Hoigne.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/401. p 219-232, 2 fig, 2 tab, 24 ref.

Descriptors: Chemistry, *Radiation, Waste treatment, Chemical reactions, Radiation.
Identifiers: *Radiation chemistry.

Because of possible competing reactions, the radiation sequences initiated by radiation do not produce efficient pathways for solving chemical problems in waste treatment. The reagents formed by the primary radiolytic species are too expensive to compete with conventional chemical reagents. Radiation chemistry is of interest in discussing waste problems because of its contribution to knowledge about reaction kinetics in water and because chemical effects are the basis of biological effects caused by radiation. (See also W76-09512) (Chilton-ORNL)
W76-09529

RADIATION CHEMICAL DESTRUCTION OF PHENOL IN OXYGENATED AQUEOUS SOLUTIONS,
Institut za Nuklearne Nauke Boris Kidric, Belgrade (Yugoslavia).
O. I. Micic, M. T. Nenadovic, and V. M. Markovic.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/402. p 233-239, 1 fig, 1 tab, 20 ref.

Descriptors: Chemistry, *Chemical degradation, Organic compounds, *Phenols, Radiation, Aqueous solutions, *Oxygenation.

The purpose was to study the reaction mechanism of phenol decomposition in irradiated aqueous solution to obtain information necessary to evaluate the applicability of this method to processing phenol waste-waters. The study showed the possibility of a significant increase in the phenol decomposition yield in aqueous solutions. The low dose rate, high phenol concentrations and presence of oxygen are conditions under which the chain reaction occurs and result in high decomposition yield, up to several hundreds. Because of the concentration dependence of G(-phenol) the method can only be used for a relatively low factor of destruction. The presence of other organic compounds probably has no significant influence on the decomposition yield but inorganic ions terminate the chain reaction. A very low dose rate has to be used and this necessitates a long treatment time. (See also W76-09512) (Chilton-ORNL)
W76-09530

EFFECTS OF GAMMA RADIATION FROM CO60 ON DILUTE AQUEOUS SOLUTIONS OF LINEAR ALKYL SULFONATE SURFACTANTS AND OTHER ORGANIC POLLUTANTS,
Florida Inst. of Tech., Melbourne.
D. M. Rohrer.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/404. p 241-248, 3 fig, 17 ref.

Descriptors: *Biodegradation, Chemistry, *Chemical degradation, *Radiation, Organic compounds, Surfactants, *Linear alkylate sulfonates, Detergents, Pesticides, Cobalt radioisotopes.
Identifiers: *Cobalt-60.

Linear Alkyl Sulfonate Surfactants are considered biodegradable but the time required for biodegradation is impractical within the present environmental guidelines. The paper presents research findings on alternate techniques of treatment for the destruction of Linear Alkyl Sulfonate Surfactants. The effect of radiation on the surfactant solution was greatly affected by the initial concentration of the test solution. Solutions of greater concentrations than 15 mg/l gave erroneous results due to the small amount of dissolved oxygen available within the fluid. Data indicated that while there was a small increase in the destructive powers of the gamma radiation at lowered dose rates the increase was not significant from a treatment standpoint. In studying the effects of ionizing radiation on pesticides, it was found that there was a reduction in ethyl parathion concentrations of 26% at the end of 8 hours irradiation and of 32% after 24 hours. A substantial ability for radiochemical destruction of this pesticide was indicated. (See also W76-09512) (Chilton-ORNL)
W76-09531

EFFECTS OF GAMMA IRRADIATION ON THE DEGRADATION OF DYES,
Politecnico di Torino (Italy). Instituto di Chimica Industriale.
N. Piccinini, and F. Ferrere.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/407. p 249-264, 3 tab, 6 fig, 24 ref.

Descriptors: Chemistry, *Chemical degradation, *Irradiation, Gamma rays, Organic compounds, *Dyes, Biodegradation.

The effects of gamma irradiation versus the dose, the dye concentration, the pH and the oxygen content of aqueous solution of several classes of dyes was investigated. Anthraquinonic dyes were irradiated in a wide range of doses up to 5 Mrad. It was found that the decolorization process with gamma radiation occurs by radical reactions caused mainly by primary radiolytic species. The highest degradation yields were obtained at low doses and high concentrations; the dissolved oxygen develops a synergic effect and the pH conditions differently influence the degradation according to the dye type. The degradation is associated with oxidation processes and enhanced by solution aeration. (See also W76-09512) (Chilton-ORNL)
W76-09532

POSSIBLE USE OF HIGH-LEVEL RADIATION FOR THE DEGRADATION OF SOME SUBSTANCES PRESENT IN URBAN AND INDUSTRIAL WATERS,
Palermo Univ., Italy, Istituto di Applicazioni e Impianti Nucleari.
C. Cappadona, P. Guarino, E. Calderaro, S. Petruso, and S. Ardica.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/408. p 265-284, 6 fig, 6 tab, 11 ref.

Descriptors: *Waste water treatment, *Chemical degradation, Pollutants, Gamma rays, Organic compounds, *Irradiation, Dyes, Pesticides, Solvents, Industrial wastes.

Tests were conducted on solutions or suspensions of organic solvents, dyes, pesticides and chlorophenols in static and in dynamic aerated systems using commercial products immersed in liquids drawn from industrial waters. Treatment with gamma radiation caused a degradation of these substances which was related to pH, oxygenation and composition of the medium and to the mixture of commercial products. It was generally concluded that benefits from the use of ionizing radiation in the ecological field will be dependent upon the cost of plant and radioactive sources. (See also W76-09512) (Chilton-ORNL)
W76-09533

DEGRADATION OF PERSISTENT ORGANOCHLORINE POLLUTANTS BY GAMMA RADIATION AND ITS POSSIBLE USE FOR WASTE-WATER TREATMENT,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Okologische Chemie.
L. Vollner, H. Rohleder, and F. Korte.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/409. p 285-296, 6 fig, 2 tab, 10 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, Pollutants, Organic compounds, Gamma rays, *Radiation, Chemical degradation.

Radiation yield and degradation chemistry of some organochlorine pesticides, polychlorinated biphenyls and related chemicals subjected to gamma radiation were investigated. It was found that the pattern of hexane extractable compounds obtained from acetone-water and from pure water solutions are not very different when compared by GC-analysis; no distinct main degradation product was detectable in any of the investigated solute-solvent systems but a number of compounds formed simultaneously; and dechlorination and dehydrochlorination were found to be the most important mechanisms of the first attack. Persistent polychlorinated compounds in solution were found to be affected by gamma radiation and if the radiation dose is high enough, these compounds are totally decomposed. (See also W76-09512) (Chilton-ORNL)
W76-09534

COMPARISON OF THE CHEMICAL EFFECTS OF OXONE AND OF IRRADIATION ON ORGANIC IMPURITIES IN WATER,
Edgenoessische Technische Hochschule, Zurich (Switzerland). Inst. for Aquatic Sciences and Water Pollution Control.
J. Hoigne.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/410. p 297-305, 3 fig, 1 tab, 21 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, *Irradiation, Chemical degradation, Gamma radiation, *Ozone, Oxidation.

In either radiation or ozone treatment of aqueous oxygenated solutions the hydroxyly radicant can become the main species for the oxidation of organic impurities. The oxidizing intermediate produced by ozone was identified by comparing its reaction selectivities with those known for the hydroxyl radicals initiated by high-speed irradiation. From cost comparisons of the two methods it was concluded that ozone is a much cheaper oxidant than radiation and that radiation has to provide other advantages if it is to be considered as an oxidant for the removal of dissolved organics in waste waters. (See also W76-09512) (Chilton-ORNL)
W76-09535

ALTERNATIVE HIGH-LEVEL RADIATION SOURCES FOR SEWAGE AND WASTE-WATER TREATMENT,
Division of Biomedical and Environmental Research (USERDA), Washington, D. C.
D. S. Ballantine.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21 1975. IAEA-SM-194/501. p 309-323, 4 tab, 5 fig, 9 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, *Radiation, Gamma rays, Radioisotopes, Cost-Benefit analysis, *Sewage treatment.
Identifiers: Electron accelerators.

An electron accelerator or a gamma-ray source of radioactive cobalt or caesium are the present choices of an energy source for the radiation treatment of waste-water or sludge. Several factors will affect the ultimate choice and the potential future adoption of radiation as a treatment technique. The paper reviews these factors and emphasizes the following points: (1) Gamma-ray sources offer advantages of deep penetration capability and adaptability to a variety of geometries; (2) accelerators are characterized by low penetration capability, high dose rates and inflexibility to facility design; (3) the supply of radiosotopic power is contingent upon the growth of nuclear power plants and fuel separation plants; (4) accelerators offer a six- to ten-fold advantage in initial capital cost and a two-fold advantage in overall operating cost and could provide unlimited radiation power; and (5) applications will be limited to areas that can tolerate costs in the range of $1-2 / 1000 gallons. (See also W76-09512) (Chilton-ORNL)
W76-09536

USE OF HIGH-POWER ELECTRON BEAM RADIATION FOR THE TREATMENT OF MUNICIPAL AND INDUSTRIAL WASTES,
Radiation Dynamics, Inc., Westbury, N. Y.
M. R. Cleland, J. P. Farrell, R. L. Malnati, and K. H. Morganstern.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. LAEA-SM-194/502. p 325-342, 6 fig, 3 tab, 1 append, 17 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, *Radiation, Industrial wastes, Costs, Municipal wastes, Water quality.
Identifiers: Electron accelerators.

The technology involved in the recent development of electron beam accelerators can be applied to the irradiation of waste materials. These accelerators can provide 150 kW of useful beam power for continuous service and could process 3.1 million gallons daily of water to an average dose of 0.1 Mrad at a unit cost of about $0.22 per 1000 gallons. Systems for large-scale application delivering up to a megawatt of power would further reduce the radiation processing cost and increase the capacity to about 22 million gallons daily. While the cost would not be competitive with conventional treatment methods, the improved quality of the effluent material and the reduced burden on the environment may justify the use of this kind of radiation in advanced waste treatment processes. (See also W76-09512) (Chilton-ORNL)
W76-09537

PROSPECTS FOR HIGH-ENERGY ELECTRON IRRADIATION OF WASTE-WATER LIQUID RESIDUALS,
Massachusetts Inst. of Tech., Cambridge.
J. G. Trump, K. A. Wright, E. W. Merrill, A. J. Sinskey, and D. Shah.
In: Radiation for a Clean Environment, Proceeding of a symposium held in Munich, March 17-21 1975. LAEA-SM-194/503. p 343-354, 5 fig, 17 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, *Radiation, Radioisotopes, Safety factors, Costs.
Identifiers: *Electron accelerators.

A proposal is presented to set up a high-energy electron research facility at Boston's MDC wastewater treatment plant. The system, powered by a commercial 50kW electron accelerator, could treat 100 kilogallons of selected materials to a dose of 400 kilorads daily. The penetration, irradiation time, safety, flexibility and availability of the ionizing energy produced by electron accelerators is compared to that from radioisotopes. High-energy electrons from machine source are believed to possess the greatest advantages in safety, adequacy and economy for waste treatment. (See also W76-09512) (Chilton-ORNL)
W76-09538

AN ELECTRON ACCELERATOR WITH ELECTRONS OF LOW-ACCELERATING VOLTAGE FOR IRRADIATING SEWAGE SLUDGE AND WASTE WATER,
Polymer-Physik G.m.b.H., Co., Kg., Tuebingen (West Germany).
P. Holl, and H. Schneider.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21 1975. LAEA-SM-194/506. p 355-358, 3 fig.

Descriptors: *Waste water treatment, *Irradiation, Sewage treatment, Sludge treatment, Sewage sludge.
Identifiers: *Electron accelerators.

An accelerator with high-vacuum insulation and an operating voltage of 400 kV is described. The high-voltage strength of an accelerator is achieved by the interposing of screen cylinders maintained on definite potentials by resistors. Insulating pressure gas is not required. Findings have shown that such beams will be sufficient to irradiate liquid materials if the sewage sludge or waste water is mixed thoroughly during the irradiation process. (See also W76-09512) (Chilton-ORNL)
W76-09539

PRACTICAL ASPECTS OF THE PASTEURIZATION OF SEWAGE SLUDGE BY ELECTRON IRRADIATION,
Allgemeine Elektricitaets-Gesellschaft, AEG-Telefunken, Hamburg (West Germany).
M. Tauber, E. G. Hofmann, and B. P. Offermann.
In: Radiation for Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/509. p 359-366, 4 tab, 1 fig, 5 ref.

Descriptors: *Environmental sanitation, *Sewage treatment, *Irradiation, Safety, Economics, *Disinfection, Waste treatment.
Identifiers: *Electron accelerators, *Pasteurization.

Investigations have shown that radiation pasteurization is the most preferable treatment for disinfection of sewage sludge. Irradiation doses in the region of 200 krad achieve high degrees of bacterial disinfection and the filterability increases with this method. It is stated that radioisotope sources are considered to be neither economic or safe. The practical aspects of commercial process lines for electron irradiation are considered in terms of the effectivity of the electron radiation process, limited penetration of electrons into material, beam power of electron accelerators, safety aspects, economics, and environmental aspects. (See also W76-09512) (Chilton-ORNL)
W76-09540

FISSION PRODUCT GAMMA-RAY SOURCES AS AN ALTERNATIVE TO COBALT-60 SOURCES FOR SEWAGE SLUDGE STERILIZATION,
Eidgenoessisches Institut fuer Reaktorforschung, Wuerenlingen (Switzerland).
V. R. D. Herrnberger.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/505. p 367-389, 8 fig, 10 tab, 13 ref.

Descriptors: *Environmental sanitation, *Sewage treatment, Sludge treatment, *Gamma rays, *Irradiation, Disinfection, Costs, Cobalt radioisotopes, Sewage sludge, *Waste water treatment.
Identifiers: *Cobalt-60.

The types of sources considered as alternatives to Co 60 for sterilization of sewage sludge were spent fuel elements, mixtures of solidified fission products, and isolated solidified fission products such as Cs 134,137. Costs of these types is compared to Co 60 costs for specific plants. The results indicate that the profitability of fission products as gamma sources cannot be questioned when compared with Co 60. Results depend on encapsulation costs and on the amount of self-absorption losses. The integrated facilities and caesium versions appear to be most attractive from the viewpoints of cost and safety. (See also W76-09512) (Chilton-ORNL)
W76-09541

COSTS AND HYGIENIC NECESSITY OF SEWAGE SLUDGE PASTEURIZATION IN SWITZERLAND,
Edgenoessische Technische Hochschule, Zurich (Switzerland). Inst. for Aquatic Sciences and Water Pollution Control.
W. Obrist.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/507. p 391-397, 2 tab, 3 fig, 4 ref.

Descriptors: *Environmental sanitation, *Sewage treatment, Sludge treatment, Disinfection, *Costs, Public health, Sewage sludge, Waste treatment, Heat treatment.
Identifiers: *Switzerland, *Pasteurization.

Cost factors of six different plants using heat treatment methods for pasteurization of sewage sludge were determined. Data indicated the specific cost figures were between S.Fr. 3.- and 14.- per cubic metre, depending mainly on capacity and actual output of the plant. In the question of the necessity of pasteurization, energy, economic and ecological aspects were considered. It was stated that stabilized but not disinfected wastewater sludges may be applied to crop land and intensive farming throughout the year after harvesting and to grassland during the winter season. Only in regions with predominantly grassland agriculture may pasteurization of sludge be generally introduced. (See also W76-09512) (Chilton-ORNL)
W76-09542

CONSIDERATIONS IN THE PUBLIC ACCEPTANCE OF SEWAGE SLUDGE IRRADIATION SYSTEMS,
Atomic Energy Commission, Washington, D. C.
G. P. Dix.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/508. p 399-408, 1 fig, 5 ref.

Descriptors: *Sanitary engineering, *Irradiation, *Sewage treatment, Safety, Information exchange, Sewage sludge, *Attitudes, Waste treatment.
Identifiers: Public acceptance(Wastes).

Sludge irradiation have a high potential for benefit when viewed from the standpoints of reduced consumer costs, minimization of public risk and enhancement of the quality of life and the environment. Design, procedural and administrative safeguards of the plant must be fully explained to dispel public concern in these areas and particularly the concern that the contents of the source can be released to the sludge accidentally. This is seen as the main issue in public acceptance. (See also W76-09512) (Chilton-ORNL)
W76-09543

THE WASTE-WATER AND SLUDGE RE-USE PROJECT BY GAMMA IRRADIATION AT KECSKEMET, HUNGARY, SOME APPROACHES AND INVESTIGATIONS,
Phylaxia Vaccine and Feedstuff-Producing Enterprise, Budapest (Hungary).
J. Simon, F. Gacs, and A. Urban.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/603. p 411-417, 2 fig, 2 tab, 4 ref.

Descriptors: *Sanitary engineering, *Waste water treatment, *Sludge treatment, *Irradiation, Disinfection, Gamma rays, Water reuse, Gamma rays, Cobalt radioisotopes.
Identifiers: Hungary, Cobalt-60.

Before the start of the gamma radiation project, the waste-water samples were found to be positive in regard to Salmonella bacteria and to Staphylococcus aureus, Pseudomonas aeruginosa and bacteria from the Proteus group. After irradiation the samples were investigated and generally it was established that, parallel with the increasing dose of Co 60 gamma radiation, the values of the investigated parameters(biological, bacteriological and chemical) decreased significantly. The most significant reduction was found in the numbers of myco-bacteria, faecal coliforms, and in the Pseudomonas aeruginosa. The irradiation facility combines the advantages of continuous operation without dead time with a high utilization factor of the energy emitted and a proposed good homogeneity of the irradiation. (See also W76-09512) (Chilton-ORNL)
W76-09544

PILOT PLANT EXPERIENCE IN THE TREATMENT OF INDUSTRIAL AND MUNICIPAL WASTE-WATER BY MEANS OF RADIATION-INDUCED OXIDATION,
International Purification Systems, Inc., Atlanta, Ga.
W. C. Hay.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/601. p 433-446, 7 tab, 2 fig, 3 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, Radiation, *Oxidation, Bacteria, Recycling, Chemical oxygen demand, Biochemical oxygen demand, *Pilot plants, Disinfection, *Irradiation, Treatment facilities.

The pilot plant utilizes the principle of adsorption of organics from waste-water to activated carbon and dynamic regeneration of the carbon by radiation induced oxidation. Operations of a pilot plant designed and constructed to process wastewater bearing an organic concentration of 100 ppm at a flow rate of 5000 gallons daily required strict adherence to and consideration of the design capacity. Variations in flow rate must be made in direct proportion to the organic contents of the wastewater. COD and BOD reduction, colour and odour elimination were found to be directly related to the quantity of dissolved oxygen in the waste-water and the radiation dose. Bacteria kills ranged above 95% with the coliform bacteria kill being 99%. The primary goal of the work was to reduce COD, BOD and bacteria content to a level acceptable for discharge into navigable waters but it was found that the process yields a water product suitable for recycle. (See also W76-09512) (Chilton-ORNL)
W76-09545

EXPERIENCE WITH A PILOT PLANT FOR THE IRRADIATION OF SEWAGE SLUDGE; DESIGN, OPERATION EXPERIENCE AND COST CALCULATIONS AFTER 18 MONTHS OF CONTINUOUS RUNNING,
Planungs-und Betriebsbure des Abwasserverbandes Ampergruppe, Eichenau (West Germany).
T. Lessel, H. Motsch, E. Hennig, A. Suess, and A. Rosepule.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/504. p 447-464, 4 tab, 9 fig, 6 ref.

Descriptors: *Environmental sanitation, *Waste water treatment, *Irradiation, *Pilot plants, *Sewage treatment, Design, Operations, Costs, Performance, Treatment facilities, Sewage sludge.

Although the plant was intended to carry a daily load of 150 cubic meters of sludge to be irradiated at a dose of 300 krad, for testing purpose the load has been only 30 cubic meters per day. Difficulties were encountered with dirt accumulating in the filter of the cooling circuit and with the formation of chemical deposits in the plant. Significant alterations were made and a regular weekly rinsing to prevent the dirt accumulation is carried out. Results show that the plant can be operated economically as compared with heat treatments and without specially trained personnel. (See also W76-09512) (Chilton-ORNL)
W76-09546

DOSIMETRY AT A HIGH-ACTIVITY CO60 WASTE TREATMENT FACILITY,
Gellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Strahlenschutz.
D. F. Regulla, G. Schurmann, and A. Suess.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/605. p 465-476, 11 fig, 1 tab, 6 ref.

Descriptors: *Environmental sanitation, *Waste treatment, *Irradiation, Radioisotopes, Treatment facilities, Cobalt radioisotopes.
Identifiers: Dosimetry, *Cobalt-60.

The pilot study was performed at a radiation waste treatment facility which used a 150 kCi Co60 source. The dosimetry problem arose from the radiation field being highly discontinuous in dose-rate and unknown with respect to the effective photon energy distribution. Difficulties also existed in determining the degree of dose homogeneity over the whole sludge filling and the fact that the dose meters passed a turbo pump. The discoloration of silver-activated metaphosphate glass was the method used for the dosimetry program and for purposes of energy-independent reference dosimetry, a TL technique using lithium was employed. Both systems were checked against a chemical dose meter on an iron sulfate basis for control purposes. (See also W76-09512) (Chilton-ORNL)
W76-09547

EXPERIENCE WITH A PILOT PLANT FOR THE IRRADIATION OF SEWAGE SLUDGE, BACTERIAL AND PARASITOLOGICAL STUDIES AFTERIRRADIATION.
Institut fur angewandte Hygiene, Munich (West Germany).
I. Wizigmann, and F. Wursching.
In: Radiation for a Clean Environment, Proceedings of a symposium held at Munich, March 17-21, 1975. IAEA-SM-194/606. p 477-484, 5 tab, 7 ref.

Descriptors: *Environmental sanitation, *Sewage treatment, *Waste treatment, *Irradiation, Radioisotopes, Bacteria, Disinfection, *Parasitism, *Pilot plants, Bactericides, Sewage sludge, Treatment facilities.

Mechanical-biological treatment of sewage sludge reduced the total bacterial count and that of the Enterococces by 2 log and the Enterobacteria by 3 and 4 log. In 25 unirradiated samples of digested sludge, Salmonella was present in 16. With irradiation, further reduction of viable micro-organisms was attained. Of 40 samples, after irradiation 38 were free of Salmonella. The results of the model experiments showed that susceptibility of micro-organisms varies with different species. In parasitological experiments, after irradiation no visible microscopic change was found in the eggs of Ascaris suum. Segmentation was delayed and further development of the egg ceased after the morula formation. Segment outlines were hazy after three weeks of incubation and the segments themselves showed degenerative changes. (See also W76-09512) (Chilton-ORNL)
W76-09548

EXPERIENCE WITH A PILOT PLANT FOR THE IRRADIATION OF SEWAGE SLUDGE, EXPERIMENTS ON THE INACTIVATION OF VIRUSES IN SEWAGE SLUDGE AFTER RADIATION TREATMENT,
Landesuntersuchungsamt fuer das Gesundheitswesen Sudbayern, Munich (West Germany).
C. Epp.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/607. p 485-490, 3 tab, 13 ref.

Descriptors: *Environmental sanitation, *Waste treatment, *Sewage treatment, *Irradiation, *Pilot plants, *Viruses, Disinfection, Sewage sludge, Treatment facilities.

Depending on the time of the year samples were taken, the presence of one or more virus types was found in impure sewage water. Viruses were determined eight times with 33 digested sludge samples before hygienization and twice with the 33 samples after hygienization. One radiation volume was infected with attenuated polio virus type I packed into capsules. After hygienization, the capsules were recovered and the virus content was found to have been reduced more than 90%. (See also W76-09512) (Chilton-ORNL)
W76-09549

EFFECTS OF GAMMA RADIATION AT PILOT PLANT LEVEL COMPARED WITH THE EFFECTS OF PASTEURIZATION ON THE DEWATERING OF SEWAGE SLUDGE,
Association Euratom-ITAL, Wageningen (Netherlands).
A. F. Groneman.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/608. p 491-502, 4 tab, 3 fig, 12 ref.

Descriptors: *Waste treatment, Chemical properties, Physical properties, Sludge, Filtration, *Irradiation, Disinfection, Sewage sludge, *Pilot plants, Treatment facilities, *Dewatering, Gamma rays.
Identifiers: *Pasteurization.

Results of this investigation indicated that gamma irradiation considerably improved the dewatering characteristics of two anaerobically digested sludges. The specific resistances of sludges were significantly reduced by 300 krad of gamma irradiation in laboratory experiments as well as in full-scale experiments. Information obtained from filterability tests was confirmed by plant operators. The conditioning effect of gamma radiation persisted for more than 20 days, indicating permanent changes in the physical-chemical sludge properties that govern the dewatering of sludge. Pasteurization deteriorated dewatering characteristics, increasing the specific resistance to values that were roughly four times as high as the values in irradiated sludge. (See also W76-0951) (Chilton-ORNL)
W76-09550

EXPERIENCE WITH A PILOT PLANT FOR THE IRRADIATION OF SEWAGE SLUDGE, RESULTS ON THE EFFECT OF DIFFERENTLY TREATED SEWAGE SLUDGE ON PLANTS AND SOIL,
Bayerische Landesanstalt fuer Bodenkultur Pflanzenbau und Pflanzenschutz, Munich (West Germany).
A. Suess, A. Rosopule, H. Borchert, T. Beck, and J. Bauchhenss.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/609. p 503-533, 9 fig, 14 tab.

Descriptors: *Environmental sanitation, *Waste treatment, Sewage sludge, *Irradiation, Heat treatment, Soils, Plant physiology, Treatment facilities.

Experiments indicated that the treatment of sewage sludge may be less important than soil properties and water capacity. Greenhouse studies indicated that there is a slightly better effect from irradiated sludge than from untreated sludge but that heat-treated sludge gives a decrease of desireable effects. Smaller microbial activites were usually found after applications of heat treated sludge but there was little difference noticed between activity with untreated and irradiated sludge. Depending on the type of soil, studies showed an increase in the effective field capacity after the application of sewage sludge with the best effects often occurring with irradiated sludge. (See also W76-09512) (Chilton-ORNL)
W76-09551

EXPERIENCE WITH A PILOT PLANT FOR THE IRRADIATION OF SEWAGE SLUDGE, ANALYTICAL STUDIES ON SEWAGE SLUDGE AND PLANT MATERIAL,
Technische Universitaet, Munich (West Germany). Institut fuer Radiochemie. Bayerische Landesanstalt fuer Bodenkultur, Pflanzenschutz, Munich (West Germany).
A. Rosopule, I. Fiedler, H. Staerk, and A. Suess.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/610. p 535-551, 10 tab, 2 fig.

Descriptors: *Analytical techniques, *Sewage treatment, Sludge, Heat treatment, Radiation, Nutrient removal, Treatment facilities, *Pilot plants, Trace elements, Sewage sludge, *Irradiation, Waste treatment.

Analytical studies conducted over a year's time showed that there is little difference in mineral contents and trace elements occurring in the sludge. Heat treatment tended to increase the ammonium content up to 70% over untreated sludge. Radiation treatment showed no changes in the sludge up to a pH of 8 and above that pH losses of ammonium were observed. Dewatering decreased the content of alkali elements, potassium, sodium, and ammonium, in the sludge but no change was found in other materials. (See also W76-09512) (Chilton-ORNL)
W76-09552

RECENT ADVANCES IN THE TREATMENT OF SOLID WASTES,
Technion-Israel Inst. of Tech., Haifa.
G. Shelef, and M. Lapidot.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/702. p 555-577, 7 fig, 1 tab, 128 ref.

Descriptors: *Solid wastes, *Recycling, *Waste treatment, *Reviews, Economics, *Bibliographies, Waste disposal.

This review paper discusses sanitary and safe disposal of solid wastes from the view point of resource recovery of raw material and energy. Conventional disposal methods such as landfilling, incineration and composting are described as well as comminution and separation techniques. The separation techniques include gravity separation, aerodynamic separation and magnetic and electrostatic separation. It is emphasized that the inherent values of the various components of solid wastes, in the form of recoverable, recyclable, and re-usable materials and energy, can provide the basis of an economic and safe solution to the disposal. (See also W76-09512) (Chilton-ORNL)
W76-09553

USE OF SEWAGE SLUDGE AS FODDER,
Batelle-Institut e.V., Frankfurt am Main, (West Germany).
W. Schonborn.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/701. p 579-588, 6 tab, 2 fig, 24 ref.

Descriptors: *Environmental sanitation, *Sewage sludge, Sewage treatment, *Foods, Nutrients, *Disinfection, Waste treatment.

One possible way of utilizing the protein and vitamin content of sewage sludges would be their use as fodder. It is recognized that a number of objections, (the presence of pathogenic bacteria, toxic substances (especially carcinogens), quantities of heavy metals, and some species of microorganisms,) exist to the use of sludge as fodder. The author feels that these objections can be overcome by disinfection of the sludge and cites instances of successful feeding experiments. (See also W76-09512) (Chilton-ORNL)
W76-09554

POTENTIAL OF RADIATION STERILIZATION IN SOLID WASTE TREATMENT, A STATUS REPORT,
Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Centre.
R. Padova, M. Lapidot, M. Molco, and I. Ross.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/703. p 589-599, 3 tab, 38 ref.

Descriptors: *Environmental sanitation, *Solid wastes, Radiation, Disinfection, Foods, Animals, Reviews, *Waste treatment, *Irradiation.

The particular character of household garbage and of agricultural wastes renders it unsuitable for solid waste resource recovery techniques at present in use but the high nutrient content of the putrescible matter contained in the garbage render it particularly suitable for direct conversion into animal feeds. Sterilization by steam autoclaving is unsatisfactory because of the unpredictable penetration of the steam and the frequent re-contamination during cooling. Gassing with methyl bromide is not safe because of the absorption of methyl bromide in some of the components of the product. The high potential of ionizing radiation in the processing of putrescible matter into animal food is, thus, clearly indicated although not yet permitted in many countries. A pilot plant which processes 200-300 tons/day demonstrates the economic and technological feasibility of the ionizing radiation process. (See also W76-09512) (Chilton-ORNL)
W76-09555

RADIATION RECYCLING PROCESS OF WASTE POLY(TETRAFLUORETHYLENE) SCRAP,
Kyoto Univ., (Japan). Faculty of Engineering.
V. T. Kagiya, and M. Hagiwara.
In: Radiation for a Clean Environment, Proceedings of a symposium held in Munich, March 17-21, 1975. IAEA-SM-194/704. p 601-612, 6 tab, 4 fig, 4 ref.

Descriptors: *Solid wastes, *Radiation, Gamma rays, *Recycling, *Plastics, *Waste treatment, Industrial wastes.
Identifiers: Poly(Tetrafluorethylene).

Conventional methods for recycling of poly(tetrafluorethylene) (PTFE) are unsatisfactory for chemical and physical reasons. The paper describes a radiation procedure which produces PTFE in the form of a fine powdery wax. The decontaminated PTFE is irradiated with gamma rays up to 5-20 Mrad at room temperature and is then heated at 250-300 degrees C for 5-10 hours. The product is easily pulverized to a fine powder. The radiation process reduces the evolution of toxic fluorine-containing compounds which result from thermal decomposition. Irradiated scrap is more easily pulverized than non-irradiated scrap. (See also W76-09512) (Chilton-ORNL)
W76-09556

OPTIMAL ACTIVATED SLUDGE DESIGN UNDER UNCERTAINTY,
Auburn Univ., Alabama. Dept. of Chemical Engineering.
A. R. Tarrer, C. P. L. Grady, Jr., H. C. Lim, and L. B. Koppel.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE3, Proceedings paper No. 12207, p 657-673, June 1976. 5 tab, 2 fig, 28 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Design, *Optimization, *Economic analysis, *Computer programs, Capital costs, Operations research, Effects, Constraints, Mathematical models, Algorithms, Equations, *Risks.
Identifiers: Sensitivity analysis.

Designers of wastewater treatment processes must recognize and deal with the interactions among individual operations in the process stream if optimum designs are to be achieved. Care must be exercised in the use of sophisticated optimization techniques, however, if realistic as well as economic designs are to result. This article describes a mathematical model of the liquid process train (primary settler, aeration basin, final settler, chlorination) of the activated sludge process and its use to obtain the optimum design required to meet specified criteria for effluent soluble organics and suspended solids concentrations with a desired degree of confidence. Provisions were made for incorporating the uncertainty associated with experimentally determined parameters. The final settler model included both clarification and thickening functions and it was found that the clarification term exerted a strong

effect upon the final design. Liquid-solid separation parameters were found to be as important as biological kinetic parameters in determining the optimum design. Treatment cost was found to be relatively insensitive to the mean cell residence time or the suspended solids removal efficiency, although those items exerted significant effects upon the sizes of the individual unit operations. (Bell-Cornell)
W76-09628

LEAST COST DESIGN OF ACTIVATED SLUDGE SYSTEMS,
Cornell Univ., Ithaca, N. Y. Dept. of Environmental Engineering.
A. C. Middleton, and A. W. Lawrence.
Journal Water Pollution Control Federation, Vol. 48, No. 5, p 889-905 May 1976. 11 fig, 11 tab, 17 ref.

Descriptors: *Activated sludge, *Design, *Waste water treatment, *Optimization, *Costs, Operation and maintenance, Constraints, Cost allocation, Mathematical models, Systems analysis.
Identifiers: *Cost minimization.

Presented is a realistic, comprehensive approach for the cost optimization of an integrated activated sludge system consisting of a liquid treatment process train and a sludge disposal process train. The method is based on the most recent steady-state unit process models and leads to rational designs. Biological solids retention time is used as the primary independent design variable. The optimization problem is formulated by combining the equations for the various unit process models with the cost equations into an objective function. The objective function is then minimized within the acceptable design range of the independent variables. Optimal designs to several treatment situations are presented and discussed. Specifically, the change in the optimal design with changes in influent waste strength, influent waste flow, sludge settling characteristics, and sludge dispoal process trains is given. Analysis of the optimal design emphasizes the allocation of costs to the various unit processes. (Bell-Cornell)
W76-09638

ANAEROBIC TREATMENT OF LEACHATE WITH HIGH SODIUM CONCENTRATIONS,
Northeastern Univ., Boston, Mass. Dept. of Civil Engineering.
P. W. Holmes, and F. C. Blanc.
Journal of the Boston Society of Civil Engineers Section, American Society of Civil Engineers, Vol. 62, No. 3, p97-114, October 1975. 9 fig, 10 tab, 15 ref.

Descriptors: *Leachate, Control, *Waste water treatment, *Water quality control, *Anaerobic digestion, Landfills, Cations, Chemicals, Methane, Fermentation, Toxicity, Research, Biochemical oxygen demand, Chemical oxygen demand.
Identifiers: Sodium.

Leachate production is one of the effects of sanitary landfill operations which must be controlled. For many landfill sites, collection, treatment, and disposal of the leachate which drains from the fill are used to insure groundwater protection. Leachate may be treated and dispersed into the environment in a harmless manner as other wastewaters are. Treatment could be achieved by a number of different methods. Despite some investigations, the design engineer is generally faced with limited information and data on the treatability of this strong, variable wastewater. This paper examines anaerobic decomposition as a leachate treatment process. In addition to presenting data for operating criteria, this research also investigates the effect of sodium, the cation present in highest concentration in leachate, on the efficiency of the anaerobic leachate treatment process. Information presented in this paper is also applicable to an understanding of anaerobic decomposition and the inhibition of methane fermentation in landfills. This information would be of value in cases where methane is collected from the fill on a commercial basis. (Bell-Cornell)
W76-09641

EFFECTS OF SHOCK TEMPERATURE ON BIOLOGICAL SYSTEMS,
Michigan Technological Univ., Houghton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W76-09660

REVERSE OSMOSIS -- CAN IT REPLACE DISTILLATION,
C. F. Frith.
Chemical Processing, p 19, 21, January, 1976. 3 fig, 2 tab, 8 ref.

Descriptors: *Reverse osmosis, *Filtration, *Waste water treatment, Treatment facilities, Membrane processes, Desalination.

Consolidating engineering, production, and maintenance personnel in treatment plants has improved efficiencies, but quality is more variable. Central system maintenance affects every user, downtime stops all production, the method of sanitizing or chemical cleaning may adversely affect special end products, the main system's quality problems have tremendous implications for every process that requires water and, most importantly, those processes for which superior quality is justified are often compromised by emphasis on budget restrictions. For these reasons, compact, point-of-use reverse osmosis (RO) systems were developed. The Milli-RO 15, a 15 liter/hr system operating from municipal supply, can be quickly converted into a 4 liter/hr unit by replacing the reverse osmosis cartridge, or modified to increase production rates by adding a pump module. Milli-RO systems employ prefilter and reverse osmosis modules, with a pump module between the two in the Milli-RO 40. Reverse osmosis removes many contaminants. These units can be selected, installed, and operated at the point-of-use, allowing control by the user. Eighty liters/hr can be produced by increasing pressure. Replacing the cartridge in a very short time when the system had been fouled was an important advantage to one user whose feed water quaity was very poor. RO is satisfactory as an alternative to the traditional distillation method for purifying water. (Snyder-FIRL)
W76-09667

DEVELOPMENT OF A CONTINUOUS INCLINED SAND BED FILTER,
Simon-Hartley Ltd., Stoke-on-Trent, (England).
J. T. Allanson, and E. P. Austin.
Filtration and Separation, Vol. 13, No. 2, p 165-166, 168-169, March-April, 1976. 6 fig, 5 tab, 3 ref.

Descriptors: *Filtration, Laboratory tests, *Suspended solids, *Sewage treatment, Equipment, Costs, Biological treatment, *Waste water treatment, *Filters.
Identifiers: *Sand bed filters, Filler backwashing.

A low-cost continuous filter has been developed which employs a moving sand bed in which the flows of sand and water have been arranged to minimize the possibilities of blockage. Sand is withdrawn from the center of the bottom of a cylindrical container, creating an inclined surface with the largest particles at the lowest part in the center. Liquid enters at the center and leaves from the periphery, and the sand withdrawn is cleaned and added to the edge at the top of the container. A laboratory bench model, a pilot filter, and a prototype filter were tested. The results from all were satisfactory. The laboratory model removed equal or greater amounts of suspended solids when compared to a static sand bed. The pilot filter was tested on the overflow from the biological treatment plant humus tanks at a paper mill and the final effluent from a mechanical-aeration plant treating mainly domestic sewage. Techniques for backwashing the filter were developed in case a slug of solids should enter the filter. The prototype filter was similar to the pilot plant, but larger, and it operated similarly. A standard range of such filters has been designed, using the diameter of the filter as the basic dimension. This type of filter saves civil engineering costs as compared to rapid gravity and pressure filters, because it operates continuously and therefore does not need storage facilities for use while backwashing. In a specific example analyzed, the motor horsepower needed for the pump was less than for either of the other systems, and, unlike the other systems, no automatic control was required. (Snyder-FIRL)
W76-09668

THE OPERATION OF A SIMPLEX ACTIVATED SLUDGE PILOT PLANT IN AN ATMOSPHERE OF PURE OXYGEN,
Greater London Council (England).
L. B. Wood, R. P. King, M. K. Durkin, H. J. Finch, and D. Sheldon.
The Public Health Engineer, Vol. 4, No. 2, p 36-43, March, 1976. 2 fig, 4 tab, 10 ref.

Descriptors: *Sludge treatment, *Activated sludge, *Aeration, Oxygen, *Pilot plants, Nitrification, Biochemical oxygen demand, Treatment facilities, *Waste water treatment.
Identifiers: *Oxygen activated sludge.

Replacing air with oxygen in the activated sludge process has been studied. In the first stage of the work, two sludges were treated at retention times of 4 to 8 hr at a small modified diffused air pilot plant. The second stage, using an adapted single aerator plant, included the following phases: preliminary studies to gain experience with the pilot plant; chemical adjustment of the mixed liquor pH; acclimatization of nitrifying sludge from a diffused air plant; operation with a nitrifying sludge; studying the mixed liquor suspended solids (MLSS) build-up rate by operation without withdrawing sludge; comparing retention times of 6.9, 3.9, 2.4, 1.7, and 1.2 hr, including nitrification and ratio of volatile suspended solids (VSS) to total suspended solids (TSS) at different retention times; treatment of crude sewage; and addition of ferric iron. Replacing air with oxygen did not increase the growth rate of organisms responsible for carbonaceous and ammonia oxidation or their oxidation rate for a unit mass of organisms. The maximum growth rate of Nitrosomonas can be reduced in single stage systems by low pH in mixed liquor where the latter is enclosed with oxygen, and carbon dioxide allowed to build up in the gas space. However, the greater facility provided by oxygen use in allowing high MLSS concentrations to be maintained, offers the possibility of greater hydraulic loading and smaller volumetric capacity for plants aimed only at removal of biochemical oxygen demand (BOD) load. Sludge quantity was not reduced. The growth rate of organisms oxidizing carbonaceous substrate was similar to that with air-based sludge and produced a similar sludge yield. Generally sludge settlement, as measured by the standard procedure and used to calculate linear settlement rate, revealed no special advantage to oxygen use. (Snyder-FIRL)
W76-09669

WASTEWATER TREATMENT IN NEW ZEALAND,
Auckland Univ., (New Zealand). Dept. of Civil Engineering.
I. W. Gunn.
The Public Health Engineer, Vol. 4, No. 2, p 49-55, March, 1976. 1 fig, 7 tab.

Descriptors: *Waste water treatment, *Design, *Treatment facilities, Industrial wastes, Biological treatment, Water pollution control.
Identifiers: *New Zealand.

Considerable experience has been gained in the design and operation of treatment plants for a population of less than 5000 in New Zealand. Public sensitivity to effluent discharge is high, since most population centers are near major rivers or the coast, and estuaries and coastal waters are used for recreation and shellfishing. Farm wastes posing pollution problems include artificial fertilizers as well as animal wastes. Meatworks and dairy factories have been slower than municipalities to invest in pollution control equipment, although this type of industry produces a greater waste load. Individual household disposal systems designed according to the 1961 Codes of Practice have not been successful, and such individual systems are discouraged. The 'Imhoff' tank has been widely used for settling and sludge stabilization in small plants prior to biological treatment. Variations of the 'Pasveer Ditch' process have been used in some areas. Package plants are used in a few communities and for private treatment plants; extended aeration is the most common process. Lagoons are the most widely used method of treating community waste water. Fifteen communities use tertiary treatment after conventional biological treatment, predominantly bacterial reduction lagoons. Most treatment plants are designed empirically, with allowance for future growth. The Central Government runs programs to train operators. (Snyder-FIRL)
W76-09670

FLUIDIZED BED TO HANDLE COMBINED WASTE SLUDGES,
Public Works, Vol. 107, No. 5, p 108, May, 1976. 1 fig.

Descriptors: *Sludge treatment, *Waste treatment, *Industrial wastes, Pulp and paper industry, Municipal wastes, Treatment facilities, Dewatering, Centrifugation, Design criteria, Pulp wastes, Waste water treatment.
Identifiers: Fluidized bed reactor, Municipal-industrial wastes, Combined treatment.

The waste water treatment facility being built for the Tyrone Borough Sewer Authority in Blair County, Pennsylvania, has been designed to receive white-water sludge from a nearby paper mill. The plant is modular design, will include space-saving features to accomodate plug flow or complete mix operation, and is flexible enough for varying industrial and seasonal changes. Solids load is expected to be 7900 lb/day primary sludge and 3100 lb/day secondary sludge at full capacity. Sludge, both primary and secondary, will be dewatered in a fluidized bed process, by means of a solid bowl centrifuge with the aid of a cationic polymer. In the fluidized bed reaction, fluidizing and combustion air are preheated to 1000 F by extracting waste heat from the reactor gases. Excessive particulate emissions in the exhaust gases are prevented by a high-energy wetted wall venturi scrubber followed by a packed secondary scrubber-cooler. (Kramer-FIRL)
W76-09671

VALUE ENGINEERED SEWAGE PLANT MOVES FAST,
Engineering News-Record, Vol. 196, No. 17, p 22, April 22, 1976. 2 fig.

Descriptors: *Costs, Construction, *Sewage treatment, *Treatment facilities, *Tertiary treatment, *Construction materials, Engineering, Design criteria, Waste water treatment.
Identifiers: *Value engineering.

Time and cost savings were effected in the value engineered construction of a sewage treatment plant in Concord, California. The 30 mgd tertiary treatment plant will recycle effluent from an upgraded secondary treatment plant, producing industrial cooling and process water. Due to weather and other delays, the project began behind schedule. Engineers agreed to change the foundations specification for the structure set in clayey soil when a sand lens was located about six feet below the elevation of the valve structure floor slab. The sand lens was an acceptable bearing for the structure, and excavation of only 21 feet in depth needed to be made. With the raised elevation, open cutting could be performed on three sides for the excavation on a 1.5:1 slope to install the outfall line. By eliminating the building of a cofferdam for excavation, work was completed in one, rather than five weeks. Other innovative construction techniques included the shop fabricating of 18 to 72-inch steel piping, rather than field welding; the preassembly of intake and discharge manifolds up to 60 ft long and 30 ft high; and the use of modular steel panels to assembly forms for placing wall structures. (Kramer-FIRL)
W76-09672

ANAEROBIC TREATMENT OF DILUTE WASTE WATERS,
Technische Hogeschool, Delft (Netherlands). Lab. of Chemical Engineering.
R. R. Van Der Meer, J. Van Brakel, and P. M. Heertjes.
Delft Progress Report, Vol. 1, No. 5, p 143-149, 1976. 6 fig, 4 tab, 23 ref.

Descriptors: *Anaerobic digestion, *Waste water treatment, *Sludge treatment, *Recycling, Chemical oxygen demand, Equipment, Sludge digestion.
Identifiers: Stirred up-flow reactor(ISUR).

The application of anaerobic digestion to purification of dilute waste water was studied. Five reactors were used: a packed up-flow reactor (PUR) filled with high porosity polymer objects, a PUR filled with 2 to 3 cm gravel, an intermittently stirred up-flow reactor (ISUR), an ISUR with a device to break floating sludge, and an ISUR with sludge recycling. Simple substances such as acetate, glucose, and beet sugar were used to simulate waste water. An anaerobic up-flow reactor can reduce the chemical oxygen demand (COD) of these model waste waters to 10%. Two to 5 kg COD/cu m day is the maximum organic loading, corresponding to 7 to 18 hr retention times. Twenty to 50 days are required for a system to completely adapt to a particular feed. After adaptation, it adjusts easily to changing conditions and recovers rapidly from short disturbances such as a pH drop. There were no significant differences between the behavior of the packed bed and the ISURs. (Snyder-FIRL)
W76-09673

A STUDY OF ROTATING-DISC TREATMENT UNITS OPERATING AT DIFFERENT TEMPERATURES,
Loughborough Univ. of Technology (England). Dept. of Civil Engineering.
K. V. Ellis, and S. E. I. Banaga.
Water Pollution Control, Vol. 75, No. 1, p 73-91, 1976. 13 fig, 5 tab, 20 ref.

Descriptors: *Biological treatment, Hydraulics, Laboratory tests, *Biochemical oxygen demand, *Temperature, *Waste water treatment, Performance, Operations, Design, *Treatment facilities.
Identifiers: *Rotating discs treatment.

The optimum mode of operation of a rotating-disc unit (RDU) and the effects of three different temperatures on its efficiency were studied. For a 14 week preliminary period, the specially designed laboratory RDU's were operated to establish the general capabilities of the design, to gain reasonable experience in operating the unit, and to establish an optimum rotational speed for the discs. During the principal investigation, the three RDUs were operated at 11 C, 18 C, and 27 C. Various hydraulic retention periods and liquid levels were investigated. A disc rotation speed of about 4 rev/min produced the best results, and was used throughout the principal investigation. Laboratory scale RDUs were able to remove 97.5% of the biochemical oxygen demand (BOD) loading applied, and operated efficiently at over 20 g BOD/sq m d. BOD removal ability appreciably increases with temperature from 10 C to 20 C and less dramatically from 20 C to 30 C. The rotating discs should optimally be immersed 26% into the reaction vessel liquid. With the discs 26% immersed, 4 rev/min disc speed, and 97 min liquid retention, units operating at all three temperatures tested, produced effluents well within the Royal Commission standard. Effluent recirculation failed to appreciably improve the effluent. The concentration of mixed liquor suspended solids (MLSS) in the reaction vessel was about 23,000 mg/liter. This individual small unit may be between 3 and 7 times as efficient as the activated sludge process and 40 to 60 times as efficient as a conventional biological filter. (Snyder-FIRL)
W76-09674

PURIFICATION OF WASTE WATER BY POLYMER EXCHANGERS (JATEVESIEN PUHDISTAMINEN POLYMEERIVAIHTAJILLA),
E. Pulkkinen.
Kemia-Kemi, No. 1, p 6-11, January, 1976. 11 fig, 3 tab, 8 ref.

Descriptors: *Activated sludge, *Colloids, *Coagulation, *Polymers, *Polyelectrolytes, *Flocculation, *Waste water treatment, Sludge treatment, Cations, Anions, Municipal wastes, Costs, Chemical precipitation, Ion exchange, Europe.
Identifiers: *Finland.

Colloidal hydrophobic particles in water are negatively charged and it is this charge that keeps them dispersed. They can be stabilized by adding an electrolyte, which causes the ion cloud surrounding the particles to shrink; by adding an electrolyte that neutralizes the negative charge; by adding an anionic polyelectrolyte that causes the particles to bunch together; or by destabilizing the pH of the particles so that they lose their charge and coagulate. In treating domestic waste water by the activated sludge process, sludge settlement takes place more rapidly with the addition of cationic polyelectrolytes. Anionic polyelectrolytes are suitable for thickening primary waste water, whereas secondary sludge or the activated sludge is best thickened through the action of cationic polyelectrolytes. The concentration of primary sludge with anionic polyelectrolyte in the vacuum filter process works well; however, the addition of a small amount of anionic polymer (HPAM) followed by cationic polyamines works better for activated sludge. Cationic polymers have proven indispensable in concentrating municipal waste water by the centrifugal process. The cost of electrolytes has remained relatively high in Finland, which is one reason that they are not widely used in that country. Recently, the Oulu University Chemistry Department has been studying water soluble polymers, with the objective of explaining the effects of cationic polymer structures on the precipitation ability of colloids. (Reich-FIRL)
W76-09675

ASSESSMENT OF VIRUS REMOVAL BY A MULTI-STAGE ACTIVATED SLUDGE PROCESS,
Industrial Environmental Research Lab., Cincinnati, Ohio.
R. S. Safferman, and M-E. Morris.
Water Research, Vol. 10, No. 5, p 413-420, 1976. 3 fig, 6 tab, 22 ref.

Descriptors: *Viruses, *Activated sludge, *Biological treatment, Chemical precipitation, *Waste water treatment, Effluents.
Identifiers: *Virus removal.

The virus removal capacity of a complex multistage biological system combined with ap-

propriate chemical additives and final filtration was studied. The indigenous viral population in the primary effluent and after each stage of treatment were determined. The system was then seeded with phage f2 and sampled again at the same locations. The treatment process effectively reduced the seeded viruses. The highest reduction was in the high-rate activated sludge and denitrification modules, both averaging over 95% virus removal. Virus reduction for the treatment system as a whole was calculated at 99.97%. The indigenous viruses present after primary settling illustrated the wide diversions that can occur in waste waters during a 24 hr period and the necessity of collecting temporally related samples within the treatment system. There was apparently no direct relationship between the quantities of enteroviruses and coliphages present in primary effluent. (Snyder-FIRL)
W76-09676

INDUCTIVE CAVITATOR KEEPS FILTER GRATINGS CLEAR OF DEBRIS,
R. F. Stengel.
Design News, Vol. 31, No. 9, p 19, May 10, 1976. 2 fig.

Descriptors: *Filtration, *Filters, *Waste water treatment, Effluents, Equipment, Flow, Energy.
Identifiers: *Filter gratings, *Inductive cavitators.

Effluent in process plants sometimes contains solid debris that should not enter sewage lines. Installing a filter grating with suitable mesh width traps the debris, clogging the filter. Periodical shutdowns are usually used to clean the grating. Periodical or continuous mechanical means work poorly with some grating types. A solution involves a main outflow line below the grating carrying clean effluent and a secondary stream directly above the grating flushing off the debris. A mechanical oscillator at the lowest part of the tank acts through the liquid, shaking debris from the grating. The inductive cavitator is purposely run not at resonance, unlike many previous sonic systems. The off-resonance driving frequency permits precisely controlling vibratory energy delivered to the liquid. The direction of the externally polarized motion is adjustable, if needed, to distribute energy more uniformly through the liquid volume. (Snyder-FIRL)
W76-09677

EFFLUENT DETENTION PONDS DECHLORINATE WASTEWATER,
Stone (Ralph) and Co., Inc., Los Angeles, Calif.
R. Stone, H. Smallwood, and L. Bennett.
Public Works, Vol. 107, No. 5, p 90-91, May, 1976. 1 fig.

Descriptors: *Waste water treatment, *Chlorine, *Biochemical oxygen demand, Suspended solids, Analytical techniques, Treatment facilities, California, Pollutant identification.
Identifiers: *Chlorine analyzer, *Dechlorination, *Detention ponds(Wastes), Ventura River(Calif).

The Oak View Sanitary District installed a unique facility for waste water dechlorination at a minimum cost to meet the California and United States requirements for no free chlorine discharge into the Ventura River. In 1975, the optimum dosage of chlorine to the effluent was about 165 lbs per day, producing a residual 2.5 to 3.0 mg/liter at the outlet of the chlorine contact chamber. Two dechlorination ponds with a capacity of about one million gallons each provided an average retention time of over one day at the 1975 flow rate. These ponds have concrete-lined slopes and unlined floors and an average operating depth of 5.5 ft. Longitudinal baffles to improve velocity distribution restrict the flow channel width to 25 ft. The dechlorination ponds reduce 5 day biochemical oxygen demand (BOD) and suspended solids as well as reducing chlorine residuals to less than 0.1 mg/liter. Since the probe of a chlorine analyzer becomes insensitive to chlorine if it is not periodically exposed to a chlorine solution, the required residual monitor samples the chlorine contact chamber effluent and the final effluent alternately. (Snyder-FIRL)
W76-09678

SLUICE GATES HELP REGULATE PLANT'S HYDRAULIC FLOWS.
For primary bibliographic entry see Field 8C.
W76-09680

DEWATERING OF SEWAGE SLUDGE VIEWED AS PART OF THE PURIFICATION PROCESS -- PLANNING CRITERIA (KLAERSCHLAMMENTWAESSERUNG ALS TEIL DER GESAMTEN KLAERAUFGABE BETRACHTET -- PLANUNGSKRITERIEN),
G. Henseler.
Wasser, Energie, Luft, Vol. 68, No. 1, p 17-23, 1976. 7 fig, 4 tab, 13 ref.

Descriptors: *Dewatering, *Sewage sludge, *Fertilizers, *Land use, Odor, Flocculation, Oxidation, Filtration, Filters, Centrifugation, Sludge disposal, Landfills, *Waste water treatment, Sewage disposal.

Different methods for sewage sludge dewatering for subsequent distribution on farmlands or disposal on sanitary landfills are reviewed. To avoid malodorous emissions, only thoroughly digested sludge with a minimal dry matter content of 50% should be distributed on farmlands. Dewatering requires cold chemical conditioning by flocculation and oxidation, or hot conditioning at 200 C under increased pressure, which is also suitable for sludge sterilization. Low-pressure band and drum filters, vacuum filtration, high-pressure filtration and centrifugation are described. Worm centrifuges with solid jackets, operating at accelerations as low as 400 g, are able to separate over 95% of water from the sewage sludge. (Takacs-FIRL)
W76-09681

THE EFFLUENT LAGOONS GREIFSWALD-LADEBOW (DAS ABWASSERTEICHSYSTEM GREIFSWALD-LADEBOW),
S. Schwarz.
Wasserwirtschaft-Wassertechnik, Vol. 26, No. 3, p 94-96, 1976. 6 fig, 4 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Biochemical oxygen demand, *Treatment facilities, *Lagoons, Effluents, *Ventilation, Temperature.
Identifiers: *Turboventilators.

The effect of two turboventilators installed in the first member of a lagoon series with a capacity of 8,000 cu m/day and a flowthrough time of 9.3 days was studied by investigation of chemical, biochemical and biomass parameters. The observed rapid equalization of the temperatures of freshly admitted waste water and of lagoon water implies reduced heat losses to the air, and consequently high bacterial activity even during the winter period. Ventilation resulted at best in a negligible rate of activated sludge formation. The increase in the BOD5 level was due only partly to the overloaded ventilated system. Ventilation at the same time intensified the enzymatic degradation of organic substances in contact with sludge-covered surfaces. (Takacs-FIRL)
W76-09682

POSSIBILITIES AND LIMITS OF EXTENDED WASTE WATER PURIFICATION (MOEGLICHKEITEN UND GRENZEN DER WEITERGEHANDED ABWASSERREINIGUNG),
Stuttgart Univ. (West Germany). Institut fuer Siedlungswasserbau und Wassergruetewirtschaft.
F. Poepel, and I. Sekoulov.
Umweltschutz-Staedtereinigung, No. 4, p 76-80, 1976. 1 tab, 9 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Biochemical oxygen demand, *Nitrification, *Denitrification, Oxidation, Chemical precipitation, Phosphorus, Suspension, Filters, Sands, Percolation, Organic matter, Hydrogen ion concentration.
Identifiers: Nitrification/denitrification.

Possibilities and limitations of the final purification of waste water in biological treatment plant for the protection of recipients and to guarantee an adequate water quality for drinking-water preparation are described. The BOD5 level of the purified waste water can be substantially reduced by the removal of suspended matter, for which process sand filters flushed with hydrogen peroxide-treated water, and microstrainers with 20-25 micron-mesh are available. Nitrification can be intensified by the use of porous percolation bodies and sand filtration, using oxygenated water. The subsequent biological denitrification in sand filters is performed without oxygen, and the oxygen liberated from the nitrates is used for the oxidation of other organic substances. Phosphorus can be eliminated from waste waters by chemical precipitation with trivalent metal salts or lime, or by increasing the pH value by means of flue gases, sodium hydroxide, or a biological process using algae which liberate oxygen from carbon dioxide. It is possible to reduce the phosphorus level to below one mg/liter. (Takacs-FIRL)
W76-09683

THE CHEMISTRY OF OZONE IN THE TREATMENT OF WATER,
Hebrew Univ., Jerusalem (Israel). Graduate School of Applied Science and Technology.
For primary bibliographic entry see Field 5F.
W76-09684

THE RELATIONSHIP BETWEEN DISSIMILATORY NITRATE REDUCTION AND OXYGEN UPTAKE BY CELLS OF AN ALCALIGENES STRAIN IN FLOCS AND IN SUSPENSION AND BY ACTIVATED SLUDGE FLOCS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Microbiology.
J. M. Krul.
Water Research, Vol. 10, No. 4, p 337-341, 1976. 7 fig, 1 tab, 17 ref.

Descriptors: *Oxygen, Nitrates, *Flocculation, *Bacteria, Anaerobic conditions, Nitrogen, Analytical techniques, Sludge treatment, Activated sludge, *Waste water treatment, *Denitrification, Absorption, Biological treatment.
Identifiers: Oxygen uptake.

The effect of oxygen concentrations on the oxygen uptake and the dissimilatory nitrate reduction by anaerobically grown cells in flocs and in suspension was studied. A number of isolated bacteria of a denitrifying Alcaligenes strain were tested for ability to form flocs, the floc's sensitivity toward dispersion by cellulase, and denitrifying ability. Nitrate reduction by cells in flocs increased considerably at oxygen concentrations below 1.5 mg/liter. For cells in suspension, nitrate reduction increased at oxygen concentrations below 0.1 mg/liter. Cells grown anaerobically became sensitive to inhibition of respiration by nitric oxide from nitrate reduction after 24 hr of aeration in a medium free of nitrogen. As a result, nitrate reduction increased below 2.5 mg oxygen/liter for cells in flocs and below 0.1 mg oxygen/liter for cells in suspension. (Snyder-FIRL)
W76-09686

PROBLEMS CONCERNING THE CHARACTER OF OXIDIZABILITY OF CERTAIN ORGANIC SUBSTANCES IN WATER TREATED WITH

OZONE (PROBLEMES LIES A L'EVOLUTION DU CARACTERE D'OXYDABILITE DE CERTAIN CORPS ORGANIQUES PRESENTS DANS L'EAU TRATEE PAR L'OZONE),
J. C. Block, M. Morlot, and J. M. Foliguet.
Techniques et Seiences Municipales--L'Eau, Vol. 71, No. 1, p 29-34, January, 1976. 8 fig, 1 tab, 14 ref.

Descriptors: *Organic compounds, *Waste water treatment, *Ozone, Water treatment, *Oxidation, *Pollutant identification, Color, Turbidity, Biological treatment, E coli, Soils, Detergents.
Identifiers: Organic carbon, Malathion.

While the action of ozone on organic products in water produces impressive changes in such parameters as color and turbidity, it is not necessarily indicative of in depth or complete structural modifications. The evolution of biodegradability and oxygen demand, both of which vary considerably depending on the substances being treated, can impose certain constraints upon treatment such as the possible proliferation of microorganisms in the distribution network or a significant chlorine demand following ozonation. It is difficult to evaluate the efficacy of treatment or the quality of a sample due to the disparity of measures. Thus, in the case of 4 samples tested -- an E. coli suspension, a 300 ppm anionic detergent solution, a 123 ppm malathion solution, and a soil extract solution of a yellow-brown color--an identical 20% elimination of organic carbon was expressed by a disappearance of 50% color from the soil extract, of 95% turbidity of the bacterial suspension, of 96% of malathion molecules, and only of 10% of detergent. (Waltner-FIRL)
W76-09692

BIODEGRADABILITY AND PROCESS FOR BIOLOGICAL PURIFICATION OF WASTE WATER (LA BIODEGRADABILITE ET LES PROCEDES D'EPURATION BIOLOGIQUE DES EFFLUENTS),
P. Laboureur.
Techniques et Sciences Municipales L'Eau, No. 2, p 45-51, 1976. 1 fig.

Descriptors: *Biological treatment, *Biodegradation, *Waste water treatment, *Measurement, Oxygen, Organic compounds, Microorganisms, Analytical techniques, Organic matter.
Identifiers: Organic carbon.

The assessment of biodegradation is discussed. Biological degradation is a process which occurs naturally to prevent accumulation of organic matter; its agents are aerobic microorganisms. General methods of assessment are based on measurement of oxygen (respirometric method) or organic carbon. In any waste water treatment method, it is important to know the biodegradation rate. Because no known organisms are able to thrive on synthetic organics, alternative treatment methods to biological treatment must be employed. (Kramer-FIRL)
W76-09693

TURBIDIMETER LIGHTS THE WAY TO ACCURATE PROCESS CONTROL,
For primary bibliographic entry see Field 5A.
W76-09694

DEVELOPMENT OF A MEASUREMENT METHOD FOR THE TOTAL ACTIVITY RATE OF ACTIVATED SLUDGE (CONTRIBUTION A LA MISE AU POINT D'UNE METHODE DE MESURE DU TAUX D'ACTIVITE TOTALE DES BOUES ACTIVEES),
Montpellier-2 Univ. (France). Laboratoire de Genie Chimique.
J. P. Legeron, and R. B. Aim.
Water Research, Vol. 10, No. 4, p 273-278, 1976. 10 fig, 4 tab, 28 ref.

Descriptors: *Activated sludge, *Measurement, *Enzymes, *Analytical techniques, Organic compounds, Oxidation, Waste water treatment, Pollutant identification, Temperature, Incubation, Hydrogen ion concentration.
Identifiers: *Dehydrogenase activity(Sludge), TTC measurement, Triphenylformazan extraction.

An examination was made of the total dehydrogenase activity of activated sludge, according to an enzymatic reaction. Such parameters as pH, temperature, incubation time, and TTC were discussed. The extraction of triphenylformazan and the blank procedure were discussed. The extraction of triphenylformazan and the blank procedure were discussed, along with factors which influence the test. For the control of activated sludge facilities, a modified procedure for the TTC-test was provided. This takes into account organic substrate oxidation and the activity of the different dehydrogenases. (Kramer-FIRL)
W76-09695

STEROIDS IN EFFLUENTS,
Clyde River Purification Board, Glasgow(Scotland).
For primary bibliographic entry see Field 5A.
W76-09696

HOW TO BUILD A BETTER BENCH SHEET,
Las Cruces Water Quality Lab., N. Mex.
D. W. Clark.
Water and Sewage Works, Vol. 123, No. 4, p 69-71, April, 1976. 2 fig.

Descriptors: *Laboratory tests, *Data processing, *Waste water treatment, Analytical techniques, *Pollutant identification, Water analysis.
Identifiers: *Bench sheet records.

Laboratory data is valuable in waste water treatment, and a bench sheet has been developed that provides maximum assurance that each test has been properly performed while containing sufficient information that results can be rechecked. Although the bench sheet is the most important repository of laboratory information, the value of a good bench sheet is often overlooked. Bench sheets should be kept separate from interpretations of results and should be of an appropriate size for handling and filing. A bench sheet should provide spaces for complete sample identification and logical development of test data. It should also include auxiliary information and formulas and space for calculations. There should be space for comments and, where more than one person works in the laboratory, a method of accountability. Bench sheets can be designed to show either one determination for all samples or all tests performed on a single sample. A sample bench sheet provides for recording date and time, location, nature of the sample, the person collecting it, dissolved oxygen, temperature, pH, and solids determinations. Most of the data is entered in the order in which it is accumulated. Space for data on percent volatile material is included with the solids data, and for biochemical oxygen demand (BOD) on the reverse side of the bench sheet. The sample volumes most often needed to determine compliance with standards are printed on the sheet, and places are provided to indicate the individuals performing the tests. When completed, the bench sheet records the condition of the effluent on a given day. (Snyder-FIRL)
W76-09701

HOW TO DESIGN AERATED LAGOON SYSTEMS TO MEET 1977 EFFLUENT STANDARDS,
South Carolina Dept. of Health and Environmental Control, Columbia.
S. C. White, and L. G. Rich.
Water and Sewage Works, Vol. 123, No. 4, p 82-83, April, 1976. 1 fig, 1 tab.

Descriptors: *Suspended solids, *Lagoons, *Aeration, Biochemical oxygen demand, *Waste water treatment, Effluents, *Design criteria, *Aerated lagoons, *Water quality standards, *South Carolina, Treatment facilities.

As part of a four-part series on experimental studies conducted in South Carolina on the control of suspended solids in aerated lagoon effluents, this paper shows how the results of the studies are used in the design of aerated lagoon systems with effluent standards. Two classes of aerated lagoons currently in use are the completely-mixed (or completely-suspended) and the facultative (or partially-suspended) types. The completely mixed type is discussed in detail. An equation is provided to demonstrate how the residual substrate found in the effluent from a completely mixed system is based on a steady-state mass balance of an organic substrate. Temperatures of aerated lagoons can be estimated with a relationship derived from a thermal energy balance across a completely-mixed system; the appropriate equation is provided. A graph compares power-level requirements for oxygen and solids suspension in a completely-suspended aerated lagoon fitted with surface aerators to treat a typical domestic waste water. In a partially-suspended (facultative) aerated lagoon, oxygen requirements increase, due to BOD feedback from the deposited solids. Oxygen requirements may be estimated for such lagoons, with the value of the BOD removed varying from winter to summer conditions. (Kramer-FIRL)
W76-09703

LABORATORY CENTRIFUGE SAVES TIME AND MONEY,
California State Water Resources Control Board, Sacramento.
S. Martinson, and D. G. Deaner.
Water and Sewage Works, Vol. 123, No. 1, p 61-63, January, 1976. 3 fig, 1 tab, 6 ref.

Descriptors: *Analytical techniques, *Centrifugation, *Activated sludge, Suspended solids, Control, *Waste water treatment, *Gravimetric analysis.
Identifiers: Gravimetric analysis, Mixed liquor suspended solids.

Centrifugal and gravimetric analyses of activated sludge and mixed liquor suspended solids were compared for controlling the activated sludge process. Grab samples from the Sacramento County's Central Treatment plant were analyzed by both methods. The fundamental problem with using the centrifuge is that the percent centrifuge concentration is constant only for a given sludge. However, except for modes of operation such as contact stabilization and activated sludge with reaeration, the mixed liquor suspended solids and the return sludge concentration are the same sludge, and the return rate can be calculated. For an example with actual data, return rates of 27% and 26% were calculated by centrifugal and gravimetric means, respectively. However, the gravimetric results took several hours to obtain, while the centrifugal results were available in 15 min. The shorter time required for analysis enables the operator to respond more quickly to changes in the process. (Snyder-FIRL)
W76-09704

TECHNIQUE ALTERNATIVES FOR A PACKAGE STABILIZATION PLANT,
E. C. C. Li.
Water and Sewage Works, Vol. 123, No. 5, p 60-61, May, 1976. 3 fig, 2 tab, 2 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Biological treatment, *Activated sludge, *Biochemical oxygen demand, *Treatment facilities, Stabilization, Aeration, Suspended solids.
Identifiers: *Contact stabilization, *Package plants.

Deficiency of activated sludge in package contact stabilization was studied. In this process, activated sludge adsorbs small solid particles and absorbs dissolved matter in the presence of oxygen in the contact zone, is separated from the treated sewage in a clarifier, is pumped to the reaeration zone where the bacteria grow and reproduce, and returns to the contact zone. Package plants encountered process problems, mostly concerned with the activated sludge, caused by such factors as a hydraulic overload, a frequent waste shake, insufficient waste nutrients, and unbalanced turbulence. An attempt was made to correct these problems by increasing the activated sludge content and operating as an extended aeration process, but the biochemical oxygen demand (BOD) and total suspended solids (TSS) in the effluent increased significantly. The use of aeration control to build up the activated sludge was also attempted. A third alternative involves acclimating the activated sludge before adding it to the reaeration zone and adding a filter to prevent carry-over of finely divided solids into the effluent. (Snyder-FIRL)
W76-09705

INCREASING THE CAPACITY OF SEDIMENTATION TANKS BY MEANS OF SLOPING PLATES,
Water Pollution Research Lab., Stevenage (England).
M. J. D. White, R. C. Baskerville, and M. C. Day.
Water Pollution Control, Vol. 75, No. 1, p 21-30, 1976. 6 fig, 16 ref.

Descriptors: *Flocculation, *Sewage treatment, Sedimentation, Equipment, Efficiency, Installation, *Settling basins, *Waste water treatment.
Identifiers: Sloping plates.

A module of inclined tubes was installed in one of two identical humus tanks at a sewage treatment works serving a population of about 1800. Sewage was pumped intermittently, producing a cyclic flow variation in the tanks. Sloping tubes can increase the capacity of a conventional horizontal flow sedimentation tank by an amount directly proportional to their projected surface area. The temperature of the influent should not be more than 0.2C higher than that of the bulk liquid, and the module should be washed down once every one or 2 weeks. Sloping tubes appear suitable for uprating humus tanks, but less suitable for primary tanks and probably not suitable for tertiary treatment tanks without use of a flocculant. Installing sloping tubes in an existing tank is expected to be less expensive than building a new tank of the same surface area, but the plastic tubes will probably not last as long as a new tank. (Snyder-FIRL)
W76-09706

DEVELOPMENT OF EDINBURGH'S SEWAGE DISPOSAL SCHEME,
Lothian Regional Council (Scotland).
A. S. Crockett, and J. Dugdale.
Proceedings of the Institution of Civil Engineers, Vol. 60, Part 1, p 53-78, February, 1976. 20 fig, 2 tab.

Descriptors: *Waste disposal, *Outfalls, *Sewage disposal, Storm water, Sedimentation, Effluent, Interceptor sewers, Sludge disposal, Construction, Europe, Sewers, Waste water treatment, Estuaries.
Identifiers: Scotland(Edinburgh).

A conditional consent given by the Lothians River Purification Board to continue existing discharges from Edinburgh required an improvement to be completed by May 1976. The existing system involves discharge of crude sewage into the Forth estuary through a number of short outfalls. The new system devised includes interceptor sewers, primary treatment on a site reclaimed from the estuary, and disposal of the effluent through an outfall and of the sludge at sea. Geological conditions in the area are quite varied. Interception will be through storm sewage overflows with storm sewage allowed to continue down the existing sewers. Because many of the routes lie through built-up areas, much of the construction must be done in tunnels. The site for reclamation is ideal; it is well situated with respect to the outfalls, near an industrial area, under shallow water, and angularly shaped to allow for a shorter sea wall. Four large sedimentation tanks will be used for treatment. Four very large storm tanks are also provided, in which material can be held for return to sedimentation. Effluent will be discharged through 20 vertical diffuser feed pipes rising from the latter part of the outfall tunnel. It is predicted that the E. coli concentration at emenity beaches under worst conditions will be no greater than 1000/100 ml. Sludge will be discharged at sea by gravity from a moving vessel. The cost of the full scheme is estimated at 26.04 million pounds. Construction of the system is progressing, and a reduced scheme is expected to operate by autumn 1976. (Snyder-FIRL)
W76-09707

SLUDGE HEAT TREATMENT: OPERATION AND MANAGEMENT,
Peterborough Sewage Div. (England).
C. R. Whitehead, and E. J. Smith.
Water Pollution Control, Vol. 75, No. 1, p 31-39, 1976. 1 fig, 7 tab, 4 ref.

Descriptors: *Heat treatment, *Sludge treatment, *Waste water treatment, *Methane, Biological treatment, Treatment facilities, Operations, Management.

The former Urban District of Havant and Waterlooville, Great Britain, treats sludge by heated digestion followed by heat treatment, with any surplus digested sludge being treated on drying beds. Sludge was treated on drying beds and in lagoons until 1961, when experimental work and cost investigation indicated that heat treatment would be the most economical process. Methane is collected and used as the main boiler fuel for heat treatment. Several modifications have been made to the system since it was commissioned. The plant was designed for treating 145.5 cu m/d of digested sludge at 5% dissolved solids (DS) or less. The filter presses will produce a cake of at least 50% DS in a pressing period of 2 hr or less. Variations in sludge consistency and significant changes in the rate of heat absorption led to the need to chemically clean the heat exchanger. Since March 1971 the plant has been run continuously until conditions indicate that a heat exchanger wash is required. Such conditions include increased boiler pressure, increased differentials across heat transfer surfaces, fall in the acceptable level of dry solids, increased press times, fall-off in press standards, and increase in odor from the plant. Recurrent problems have involved discharge valves, mono pumps, and farm flow units. The liquor treatment facilities at the plant consist of conventionally arranged biological filters. A spray deodorizer system around the plant's perimeter and a fiberglass lid and an ozonator for the thickening holding tank are used to control odor. (Snyder-FIRL)
W76-09708

INDUSTRIAL EXPERIENCE OF SEWAGE SLUDGE PROCESSING WITH ZIMPRO INSTALLATIONS IN THE NETHERLANDS,
Witteveen and Bos., Deventer (Netherlands).
E. L. C. Koster, J. H. J. M. van der Graff, and J. G. ten Wolde.
Berichte der Abwassertechnischen Vereinigung e.V., No. 28, p 429-445, 1976. 12 fig, 6 tab, 1 ref.

Descriptors: *Sewage treatment, *Sludge treatment, *Filtration, *Dewatering, Oxidation, Industrial wastes, Nitrogen, Biochemical oxygen demand, Europe, Waste water treatment.
Identifiers: *Zimmerman process, *Netherlands.

Industrial experience in processing fresh sewage sludge by the Zimmerman process has been obtained at installations at Apeldoorn and Breda in the Netherlands. The Zimmerman process's general characteristics--insensitivity to toxic components and changes in sludge composition, completely sterilizing fresh sludge by thermal oxidation without chemical conditioning, and excellent sludge dewatering properties--were important in the final choice of the processing system. The sludge at Apeldoorn has a large contribution from paper mills and 45% organic content. The sludge at Breda has a large contribution from the canned food industry and a 73% organic solids content. The systems for dewatering and discharging the filter cake differ; Apeldoorn uses a vacuum filter and a discharge system of conveyor belts and containers, and Breda uses filter presses, chain conveyors, and silos. The high organic solids content in Breda had an unfavorable effect on the thickening results. Due to rotting, buffering of fresh sludge in thickeners adversely affects the thickening results and must be kept to a minimum. Scaling in the heat exchangers may affect the energy balance, but the scaling can be removed by acid washes. The biochemical oxygen demand (BOD), chemical oxygen demand (COD), and Kjeldahl nitrogen at Breda increased after the Zimmerman process plant came into operation. The filter cake from Breda is suitable for use as a soil conditioner, but not a fertilizer, due to the lack of nitrogen. (Snyder-FIRL)
W76-09709

NEW YORK TAKES ANOTHER GIANT STEP,
Gannett, Fleming, Corddry and Carpenter, Inc., Harrisburg, Pa. Pollution Control Div.
H. B. Gerber, and G. G. Brinckerhoff.
Water and Wastes Engineering, Vol. 13, No. 3, p 24-26, 28, 48, March, 1976. 7 fig.

Descriptors: *Treatment facilities, *Sewage treatment, *Waste water treatment, *Aeration, Tanks, Equipment, Sludge treatment, Construction, New York.
Identifiers: *New York City Jamaica treatment plant.

Construction of an upgrading project at New York City's Jamaica Water Pollution Control Plant is nearing completion. The project includes a new sewage pumping station and screenings building; conversion of the primary settling tanks to remove both grit and sludge; converting the grit building to a grit and storage building; a new system to remove grease and scum; two new aeration blowers, and a new aeration system in the aeration tanks; conversion of the gas compressor building to an effluent pumping station; a new system to distribute waste sludge to the sludge thickening tanks; a new sludge thickening tank and extensive modification to two others; a new hypochlorite building; extensive modifications to the sludge digestion tank equipment and the gas collection and storage system; a sludge force main to another water pollution control plant; all new measuring and recording instruments; modifications to the plant drainage system; and major changes to the heating, ventilating, air conditioning, plumbing, and electrical systems. The existing sewage pumping station could not be demolished until the new one was ready to operate, so the new pumping station had to be built between the existing one and the main building, only 8 ft from the latter. (Snyder-FIRL)
W76-09710

THE DESERT WAR ON POLLUTION,
N. Gardner.
Water Services, Vol. 80, No. 960, p 87-88, February, 1976.

Descriptors: *Waste water treatment, *Recycling, *Water reuse, Water treatment, Sewage treatment, Waste disposal, Aeration, Asia, *Desalination.
Identifiers: *Middle East.

Rapid industrial and social development is taking place in Middle Eastern countries which had simple agricultural economies only 10 years ago. The greater prosperity and new industries have created a demand for better water treatment facilities. Desalination of water from desert bore-holes and sea water is often done in thermal type plants, due to the abundance of energy. Due to the scarcity of water, recycling of waste water is emphasized. Processes for recycling industrial waste water usually leave a concentrated waste, which will be disposed of at sea or on land following chemical and physical or thermal treatment. Aeration, which requires a minimum of maintenance, is frequently used for sewage. The deep shaft treatment process, in which effluent is circulated between two compartments in a shaft several hundred ft deep, has significant advantages for the Middle East. Attention is also being focused on the disposal of municipal solids. They can either be incinerated, with the ash used for landfill, or can be applied directly to land as compost. Due to the shortage of local water and sewage treatment consultants in the Middle East, there is competition between European, United States, and Japanese consultants. The Middle East has accounted for large increases in exports of British water treatment contracts. However, British export regulations sometimes make it impossible for British companies to bid competitively on the larger contracts. (Snyder-FIRL)
W76-09711

MICROBIAL ASPECTS OF CARBONISATION EFFLUENT TREATMENT,
University Coll., Cardiff (Wales). Dept. of Microbiology.
D. A. Stafford.
Effluent and Water Treatment Journal, Vol. 16, No. 3, p 136-137, 139, March, 1976. 20 ref.

Descriptors: *Waste water treatment, *Microorganisms, *Bacteria, *Activated sludge, Organic compounds, Industrial wastes, Oxidation, Pseudomonas, Carbon, Biodegradation.
Identifiers: *Carbonization effluents, Thiobacilli.

Microorganisms can readily utilize compounds from carbonization liquors as energy and carbon sources. Carbonization liquors also provide elemental sources for biosynthesis. Due to their biochemical potential, microorganisms are ideally suited for the chemical transformations necessary to mineralize the organic and inorganic compounds of carbonization liquors. The predominant bacteria in the activated sludge treatment of carbonization liquors include Pseudomonads and Thiobacilli; Pseudomonads are involved in the breakdown of organics, and reduced sulfur compounds are attacked mainly by Thiobacilli. The heterotrophic organisms obtaining carbon and energy from the aromatic and heterocyclic compounds of waste liquors are closely associated with those deriving energy from other processes. Some of the constituents in the effluents can affect the metabolism of some of these microorganisms. The products of reactions carried out by the microorganisms include substances necessary for their growth. Bacteria may act on some compounds preferentially; metabolic intermediates are often used preferentially to the original compounds. Adding certain organic compounds to the liquor feed increased the biochemical oxidation rate by as much as three times. The compounds also often improve effluent quality. Studies indicate that bacteria probably do not play a role in removing liquor components in waste-tip lagoon systems. (Snyder-FIRL)
W76-09712

OPERATION OF OZONE TREATMENT APPARATUS (OZONE SHORI SOCHI NO UNTEN),
For primary bibliographic entry see Field 5F.
W76-09713

OZONE PROVIDES ALTERNATIVE FOR SECONDARY EFFLUENT DISINFECTION PART 2,
Welsbach Ozone Systems Corp., Philadelphia, Pa.
C. Nebel, R. D. Gottschling, P. C. Unangst, H. J. O'Neill, and G. V. Zintel.
Water and Sewage Works, Vol. 123, No. 5, p 82-85, May, 1976. 8 fig, 3 tab, 41 ref.

Descriptors: *Sewage effluents, *Waste water treatment, *Disinfection, *Ozone, Phenols, Suspended solids, Chemical oxygen demand, Biochemical oxygen demand, Nitrogen, Color, Odor, Oxidation, *Sewage treatment.
Identifiers: *Secondary effluents.

As the second part of a continuing article, this paper describes new, economically feasible methods using ozone for the disinfection of secondary effluents. Contaminant removal may be achieved by a two-step process utilizing flotation. Suspended solids not captured by the plant secondary clarifier may be removed from the ozone contact chamber in this process. Additionally, ozone in small dosages removes substantial amounts of colored material. Reduction of COD in secondary effluent with ozone oxidation and physical removal by frothing was seen to vary, depending upon the initial COD level of the effluent. While refractory materials are biodegradable by ozonization, BOD values are mildly increased during ozonation of industrial municipal effluents. Studies on the oxidation of nitrogenous materials by ozone have been inconclusive, and ozonolysis cannot be considered a nitrification process. Phenol reduction has been demonstrated to take place rapidly at relatively low dosages of ozone. Additionally, pH is generally shifted following ozonation of secondary effluent. The formation of weak carboxylic acids from hydrocarbons tends to reduce pH, while C02 produced in the activated sludge process being removed by sweeping large volumes of air or oxygen through the ozone contact chamber tends to increase pH. (Kramer-FIRL)
W76-09715

HYDRODYNAMIC SEPARATION OF SOLIDS FROM SOLID-LIQUID MIXTURES,
Kentucky Water Resources Research Inst., Lexington.
H. J. Sterling, Jr., and D. J. Wood.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-254 490, $7.75 in paper copy, $2.25 in microfiche. Research Report No. 94, June 1976. 211 p, 28 fig, 40 tab, 58 ref. OWRT A-048-KY(1). 14-31-0001-4017, 14-31-0001-5017, 14-34-0001-6018.

Descriptors: Water treatment, *Separation techniques, Slurries, Suspensions, Sediment transport, *Waste water treatment, Mixing, Flow, *Turbulent flow, Settling basins, Pipes, *Pipe flow.
Identifiers: *Solids removal.

Several schemes for separating solid pollutants from water flowing in a closed conduit were examined. Separation based on the momentum differential between the solids and liquids and the centrifugal movement of a conveying liquid were both examined under turbulent flow conditions. The study indicated these processes to have limited applications, primarily due to the difficulties in withdrawing a significant fraction of separated flow and the deleterious effects of turbulent mixing. However, utilization of the differential momentum of solid particles and water when flowing laminarly through a pipe was found to be a a viable separation scheme. Significant experimental separations (greater than 50 percent for pulverized coal and fly ash) were achieved. The experimental situation was modeled theoretically using particles approaching a sink located in a uniform stream. The theory closely predicted observed results for low velocity flows, with increasing flow velocity being the most significant contribution to deviations between experimental results and theory. The ratio of separated flow to flow passing the outlet was also found to affect the separation, but to a lesser degree than flow velocity. An application using small separator pipes in conjunction with a tank was shown to have potential advantages over using a settling tank alone. (Huffsey-Kentucky)
W76-09716

NATIONAL SYMPOSIUM ON URBAN RAINFALL AND RUNOFF AND SEDIMENT CONTROL,
Kentucky Univ. Lexington, Coll. of Engineering.
For primary bibliographic entry see Field 4C.
W76-09729

AN APPLICATION OF THE STORM WATER MANAGEMENT MODEL,
Envirex Inc., Milwaukee, Wis. Environmental Sciences Div.
T. L. Meinholz, C. A. Hansen, and V. Novotny.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 109-113, October 1974. 9 fig, 1 ref. EPA 800744.

Descriptors: *Model studies, *Urban runoff, *Combined sewers, Mathematical models, Water quality, Discharge(Water), Sewers, Equipment, Cities, Storms, Storm runoff, Water pollution, Water pollution control, Runoff, Rainfall, Precipitation(Atmospheric), Urban drainage, *Wisconsin.
Identifiers: *Racine(Wis).

The Environmental Protection Agency Storm Water Management Model (SWMM) uses a high-speed digital computer to predict the quantity and quality of storm water runoff for a given rainfall event. This paper discusses the application of the SWMM to a combined sewer area of 832 acres which has its wet weather discharges treated by two satellite screening/dissolved air flotation units totalling 93 cfs in capacity. It was concluded that SWMM is an accurate tool for predicting the quantity and quality of urban runoff. Naturally, the results of the SWMM are only as accurate as the input data. (See also W76-09729) (Sims - ISWS)
W76-09738

IS THE SEPARATION OF SEWERS DESIRABLE,
Hydrotechnic Corp., New York.
R. Nebolsine, and G. L. Vercelli.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 115-123, October 1974. 4 fig, 4 tab, 18 ref.

Descriptors: *Combined sewers, *Separated sewers, Economics, *Urban runoff, Storm runoff, Sewage, Municipal wastes, Sewage treatment, Pollutants, Heavy metals, Water pollution, Sediments, Sewers, Costs, Cities, Population, Industries, Waste treatment, Storage, Storage requirements, Retention, Detention reservoirs, Ecology.

All but the more recently built cities were originally provided with combined sewer systems. The concept of having two separate sewer systems gained ground some 50 years ago. The basic rationale for such a belief was that the storm runoff consisted of clean water that could be innocuously discharged without any treatment into the nearest receiving water body. Whatever technical and economic justifications there may have been for such a rule, these have been weakened by recent developments. First, as urban growth has resulted in ever greater agglomerations of population and industry, and as street traffic has intensified, it has been found that the runoff from the streets contains many contaminants in concentrations com-

parable to those in sanitary sewage. This paper contended when new sewerage facilities are being planned, one must carefully weigh the advantages and disadvantages, both in ecological and economic terms, of the two alternates, either: (1) building more costly separate sewer systems with the result that eventually treatment will be required not only of the dry weather flow, but eventually also the stormwater flows; or (2) building a combined system with the necessary flow detention or equalizing facilities that will permit treating not only the sanitary but also most of the first flush flows in one plant and cleaning up the stormwater overflows by an appropriate process and equipment in another plant or plants. (See also W76-09729) (Sims - ISWS)
W76-09739

COMBINED SEWAGE OVERFLOWS - FREQUENCY, ENVIRONMENTAL EFFECTS, AND A CORRECTIVE PROGRAM,
Clinton Bogert Associates, Fort Lee, N. J.
H. L. Kaufman.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 135-143, October 1974. 8 fig, 7 tab.

Descriptors: *Combined sewers, *Overflow, *Water pollution, Water pollution control, Sewers, Treatment facilities, Storm runoff, Urban runoff, Interceptor sewers, Detention reservoirs, Storage, Runoff, Storms, Rainfall, Pollutants, Rivers, Discharge(Water), Urban hydrology, *Delaware River, *New Jersey.
Identifiers: *Trenton(NJ).

Founded in 1679, Trenton is one of the nation's oldest cities. Like most old cities, Trenton is confronted with the problem of an inadequate sewer system. Chambersburg, a section of Trenton, comprises one-seventh of the city's land area, but its combined sewer system serves about one-half of the city's population and major industries. The remainder of the city is provided with a separate sewer system. The existing sewerage system was described. A proposed program for eliminating pollution from the city's sewage system included enlarging an interceptor and constructing a detention basin to store all combined sewage for later treatment. Calculations showed that this proposed program would keep water quality within acceptable limits for all but the highest rainfalls. (See also W76-09729) (Sims - ISWS)
W76-09741

FINANCING POLLUTION ABATEMENT EQUIPMENT FOR TEXTILES AND OTHER SOUTH CAROLINA INDUSTRIES.
Clemson Univ., S.C. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-09766

PRESENTATION CONCERNING POLLUTION CONTROL FACILITIES REVENUE BONDS,
Sinkler, Gibbs, Simon and Guerard, Charleston, S.C.
For primary bibliographic entry see Field 5G.
W76-09767

ROLE OF THE UNDERWRITER IN TAX EXEMPT FINANCING FOR INDUSTRIAL EXPANSION AND POLLUTION CONTROL,
Interstate Securities Corp., Charlotte, S.C.
For primary bibliographic entry see Field 5G.
W76-09768

THE INDUSTRIAL REVENUE BOND FOR POLLUTION CONTROL: ONE COMPANY'S PERSPECTIVE,
La France Industries, S.C.
For primary bibliographic entry see Field 5G.
W76-09769

FINANCING POLLUTION CONTROL PROJECTS IN SOUTH CAROLINA USING TAX-EXEMPT INDUSTRIAL REVENUE BONDS,
Spring Mills, Grace, S.C.
For primary bibliographic entry see Field 5G.
W76-09770

THE POLLUTION CONTROL BOND,
Clemson Univ., S. C. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-09771

A GUIDE TO THE SELECTION OF COST-EFFECTIVE WASTEWATER TREATMENT SYSTEMS,
Bechtel, Inc., San Francisco, Calif. Environmental Water Projects Dept.
R. H. Van Note, P. V. Hebert, R. M. Patel, C. Chupek, and L. Feldman.
Technical Report EPA-430/9-75-002, July 1975. 223 p. 115 fig., 8 tab., 44 ref. 68-01-1276.

Descriptors: *Sewage treatment, *Treatment facilities, *Economic efficiency, Costs, *Analytical techniques, *Cost comparisons, *Waste water treatment, Sludge treatment, Capital costs, Operating costs, Maintenance costs, Estimating, Amortization, Equations, Sludge disposal.

An aid to the identification of most of the wastewater treatment process sequences (other than land treatment and pond systems) currently available to meet point source federal and state discharge standards is presented. In addition to identifying a wide range of treatment alternatives available, guidance is given in further screening of alternatives as to their cost-effective potential, defined as that which will minimize total resources costs to the nation over time to meet water quality standards. Resources costs include capital (construction and lands); operation, maintenance and replacements; and social and environmental costs. A sewage treatment system may provide for wastewater reuse when the sale or net value from such reuse will, at a minimum, offset any additional costs to the system. Detailed are unit treatment processes which are illustrated by flow sheets; methods of cost determinations, cost curves for unit processes, factors other than cost to be considered in selecting unit processes; and calculation of capital and O and M costs, and total costs. Combined unit processes are defined and diagrammed. Procedures are given for use of the diagrams and for comparing alternative systems costs, with examples of cost-effectiveness comparisons of complete treatment systems. Appendices describe the unit processes, give cost formulae, and analyze cost effective guidelines. (See W76-09773 and W76-09774) (Auen-Wisconsin).
W76-09772

WASTEWATER SLUDGE UTILIZATION AND DISPOSAL COSTS,
Gates (W. E.) and Associates, Inc., Fairfax, Va.
T. G. Shea, and J. D. Stockton.
Technical Report EPA-430/9-75-015, September 1975. 16 p. 2 fig., 14 ref. EPA P5-01-205.

Descriptors: *Sewage treatment, *Sewage sludge, *Sludge disposal, *Cost comparisons, Amortization, Capital costs, Operating costs, Maintenance costs, Economic efficiency, Ultimate disposal, Transportation, Landfills, Estimating, *Waste water treatment.
Identifiers: Land spreading.

A series of cost relationships for five basic alternatives and two sub-alternatives of sludge disposal (the combination of sludge treatment processes and sludge transport and ultimate disposal methodologies) is presented with descriptions of the process and type of information used in creating these relationships. The variables considered are: sewage treatment plant flow rates varying from 1 to 1000 MGD; primary and secondary treatment; transport to ocean disposal by barging and land disposal by truck, rail, and pipeline; and land disposal by landfill and land spreading. Transport distances reflect those likely to be considered by Eastern Seaboard cities; barging transport costs apply to two situations--where all sludge can be loaded on a single barge loading station and where sludge is collected from a multipliity of loading stations. The material balances developed for the sludge 'flow' through the unit process trains in each alternative are based on 'tons of dry solids/day per MGD flow.' The assessment of the 288 sets of cost data develop a single-page graphical presentation allowing estimation, by alternative type of treatment, flow rate and type of distance of residuals transport, the capital costs, operating and maintenance costs, and total annual costs. The cost relationships are based on March 1975 dollars. (See also W76--09772) (Auen-Wisconsin).
W76-09773

COSTS OF WASTEWATER TREATMENT BY LAND APPLICATION,
Metcalf and Eddy, Inc., Palo Alto, Calif.
C. E. Pound, R. W. Crites, and D. A. Griffes.
Technical Report EPA-430/9-75-003, june 1975. 163 p. 41 fig., 15 tab., 61 ref., 4 append. 68-1-0966.

Descriptors: *Soil disposal fields, *Waste water treatment, *Cost comparisons, *Land use, *Estimated costs, *Economic efficiency, Water reuse, Capital costs, Operating costs, Maintanance costs, Amortization, Design, Benefits, Indirect benefits, Sewage treatment, Construction costs, Flow rates, Irrigation, Infiltration, Percolation, Overland flow, Application methods, Conveyance structures, Storage requirements, Distribution systems, Water rights.
Identifiers: *Land application.

Preliminary cost screening and detailed estimating methods for treatment alternatives involving land application of wastewater are presented. Estimates based on the preliminary data should generally be within 30% of actual costs; however, for conditions unfavorable to land application the variance could be more than 50%. Costs are divided into components, including total land area requirement, preapplication treatment, crop revenues, transmission methods, storage, application systems, and recovery of renovated water, with cost curves for each component relating to flow in mgd. The more detailed cost data enables the development of estimates for the most feasible treatment method, with cost curves for individual system components. These can easily be adjusted to reflect local and current conditions, and are expected to be accurate within 15% of actual costs. Alternative means of cost estimation are given for planting, cultivation, harvesting, yardwork, and relocation of residents. Also to be considered in cost effectiveness are revenue-producing benefits, such as sale of crops grown, sale of renovated water, sale of surplus effluent, land lease for irrigation and for recreation; and nonrevenue-producing benefits, such as social and environmental enhancement. The cost data base date is February 1973. (See also W76-09772) (Auen-Wisconsin).
W76-09774

DEVELOPMENT OF A DYNAMIC PROGRAMMING MODEL FOR THE REGIONALIZATION AND STAGING OF WASTEWATER TREATMENT PLANTS,
Utah State Univ., Logan.
S. L. Klemetson, and W. J. Grenney.
PRWA20-2, Utah Water Research Laboratory, College of Engineering, Utah State University, Logan, Utah, June 1975. 124 p, 25 fig, 34 tab, 81 ref, 3 append.

Descriptors: *Waste water treatment, *Treatment facilities, *Dynamic programming, Optimization, Regional development, Costs, Decision making,

Water quality control, Feasibility, Economies of scale, Timing, Model studies, Equations, Systems analysis, *Utah.
Identifiers: *Cost minimization, Staging, Lower Jordan River region(Utah), Capacity expansion, Sensitivity analysis.

Many cities and industries are faced with the problem of planning wastewater treatment for a growing society. Several treatment plants might be phased out to provide for a much larger regional plant with improved economies of scale in both capital and operation and maintenance costs. This research presents some criteria and a method for evaluating the timing and capacity expansion decisions for wastewater treatment facilities. Presented is a dynamic programming, economic decision model to be used as a management and planning tool by regional and local planners for the sequential expansion, upgrading, and regionalization of wastewater treatment plants at a minimum total discounted future cost. Parameters include the projected populations, wastewater quality and quantity, treatment efficiency requirements, interest rates, inflation rates, construction costs, operation, maintenance, and replacement costs, economies of scale, excess capacity, and service life. An analysis of the wastewater treatment needs of the Lower Jordan River region of Salt Lake and Davis Counties in Utah has been made using the available data. These results are then subjected to a sensitivity analysis of the input parameters. (Bell-Cornell)
W76-09845

SEWAGE TREATMENT SYSTEM,
Koehler-Dayton, Inc., New Britain, Conn. (Assignee).
R. B. Davis, and A. H. Cornish.
U.S. Patent No. 3,922,976, 2 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 941, No 1, p 99, December 2, 1975.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Water pollution treatment, Water pollution control, Water quality control, Solid wastes, *Incineration Odor.
Identifiers: Combustion, Maceration.

The sewage treatment system delivers sewage in the form of a fluid containing macerated solids to an exhaust stack or other combustion chamber for combustive reduction. The sewage is delivered to the exhaust stack only when the gases in the exhaust stack exceed a predetermined temperature. The solid portion of the sewage must be macerated into very fine particles to assure that combustion of the delivered sewage will be complete so that no solid residue or viable organisms will be discharged from the exhaust stack. To assure that there will be no residue or odor emitted from the stack, the sewage is delivered to the stack only when the temperature within the exhaust stack at the point of admission of the sewage is at least a predetermined temperature such as 675 deg F. The success of the system depends in great measure on the ability to supply the sewage to the combustion zone only when the solid component of the sewage has been macerated into very fine particles. This objective is achieved in the invention with the utilization of a positive displacement pump which includes a macerator unit and whill will discharge the macerated sewage at a flow rate far in excess of the desired flow rate to the stack. (Sinha - OEIS)
W76-09854

WATER TREATMENT PROCESS AND APPARATUS,
Gealer (Saul), Los Angeles, Calif. (Assignee).
H. K. Harms.
U.S. Patent No. 3,933,606, 7 p, 4 fig, 4 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1337, January 20, 1976.

Descriptors: *Waste water treatment, *Patents, *Water purification, *Electrolysis, *Water pollution treatment, Water pollution control, Water quality control, Flocculation, Bacteria.
Identifiers: Cyanide.

Contaminated water containing any combination of organic and inorganic suspended solids of whatever particle size, dissolved metal salts and cyanide is fed to the water treatment apparatus. The contaminated water pretreated prior to introduction into the apparatus by adjusting its pH to a range of from about 8.0 to about 10.0 by addition of an aqueous acid or base such as HCl or NaOH, as required, and by screening out gross particulate matter. The contaminated water is then fed to the column where it flows through the perforations in the plates and is exposed to the pulsating electrical signal supplied to the plates. The application of the pulsating electrical signal to the plates as the contaminated water flows through the column causes metal salts to precipitate from the solution, bacteria to be killed, and cyanide to be destroyed, and initiates formation of micro floc. The floc is then removed by clarification and filtering apparatus to yield essentially pure water and a sludge which may be further treated to recover metals and other valuable by-products. (Sinha - OEIS)
W76-09855

METHOD OF BIOLOGICAL PURIFICATION OF INDUSTRIAL EFFLUENTS FROM CHROMATES AND BICHROMATES,
V. I. Romanenko, S. I. Kuznetsov, and V. N. Korenkov.
U.S. Patent No. 3,941,691, 3 p, 1 ref; Official Gazette of the United States Patent Office, Vol 944, No 1, p 338, March 2, 1976.

Descriptors: *Patents, *Industrial wastes, Chemical wastes, Water purification, Domestic wastes, Water quality control, Water pollution control, *Water pollution treatment, Sewage treatment, *Biological treatment, Separation techniques, *Waste water treatment.
Identifiers: Chromates, Bichromates.

The industrial effluents to be treated which contain chromates and bichromates are delivered to an averaging reservoir where the content of chromium in the effluent is averaged, then the effluents are continuously fed to a sealed receiving vessel. The domestic sewage is first fed to a settler where large suspended matter settles to the bottom and the clarified sewage is continuously fed to the sealed receiving vessel. The amount of industrial effluents and domestic sewage entering the sealed receiving vessel is adjusted so as to have the amount of easily oxidized organic matter introduced with the domestic sewage at least 1.2 times higher than the amount of bound oxygen in the chromate or bichromate introduced together with the industrial effluents. The capacity of the sealed reservoir is calculated based on the time required for the chromate or bichromate to be biologically reduced. From the settler, the Bacterium dechromaticans Romanenko B-1167 is continuously fed into the sealed reservoir in amounts sufficient for the concentration of enriched culture to be maintained in the biological reducer to within 3 to 7 g per liter based on dry biomass matter. The mixture thus obtained of industrial effluents and domestic sewage together with the Bacterium dechromaticans Romanenko B-1167 culture is continuously stirred in the absence of air oxygen, then it is continuously fed to a settler tank where the Bacterium dechromaticans Romanenko B-1167 culture will settle, and the clear water free from chromates and bichromates is discharged. (Sinha-OEIS)
W76-09856

MEMBRANE SUPPORT-PLATES AND FLUID SEPARATING APPARATUS IN WHICH THEY ARE PRESENT,
Rhone-Poulenc, S.A., Paris (France). (Assignee).
B. Jamet, and J. Roget.
U.S. Patent No. 3,943,057, 5 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 944, No 2, p 832, March 9, 1976.

Descriptors: *Patents, *Separation techniques, *Membrane processes, *Water purification, *Permselective membranes, *Waste water treatment, Water pollution treatment, Water quality control, Water pollution control.
Identifiers: Membrane support.

A membrane support-plate for fluid separating apparatus is provided. The support-plate comprises a number of substantially flat elements superposed in face-to-face relation and joined to one another in a leakproof manner, each flat element being substantially symmetrical relative to a median plane passing through its thickness. The invention also provides fluid separating apparatus including two end plates and a pipeline for feeding fluid to one of the end plates and a pipeline for removing fluid from the other of the end plates and a stack of membrane support-plates each having a membrane on each face. The apparatuses are suitable for any operations of separating fluids by selective permeability, whether these fluids are in gaseous or liquid forms and whether or not they contain suspended particles. (Sinha-OEIS)
W76-09857

METHOD AND COMPOSITION FOR PREVENTING WATER CONTAMINATED WITH INDUSTRIAL WASTE FROM SEEPING THROUGH SOIL CONTAINING SAID WATER,
American Colloid Co., Skokie, Ill. (Assignee).
For primary bibliographic entry see Field 5G.
W76-09858

OPEN-LOOP WATER-WASHABLE INSPECTION PENETRANT PROCESS,
J. R. Alburger.
U.S. Patent No. 3,949,601, 6 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 945, No 2, p 613, April 13, 1976.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, Water purification, *Separation techniques, *Water pollution treatment, Water quality control, Water pollution control, Water pollution sources, Industrial production.
Identifiers: *Water-washable penetrants.

Test parts which are being inspected for the presence of surface crack defects are dipped in the water-washable penetrant and are allowed to drain. They are then washed with water to remove surface penetrant, leaving entrapments of penetrant in any crack defects which may be present. As a result, wash water which is employed for either the water-washable penetrant process or the Post-Emulsifier process contains considerable contaminants of emulsified or dissolved penetrant, and such contaminants have become an increasingly objectionable source of pollution in sewage systems or water disposal systems. The principal object of the invention is to provide a water-washable inspection penetrant process in which the penetrant is recovered for reuse, and the wash water is maintained at a low level of contamination acceptable for discharge into water-disposal systems. Certain types of low-solubility water-washable inspection penetrants, and which contain no detergent, are adaptable to a mode of usage whereby used penetrant separates from the wash water and floats to the surface of the water where it can be collected and re-used. The relatively pure water is drawn from the bottom of the holding tank and is discharged into a water-disposal system. (Sinha-OEIS)
W76-09859

APPARATUS FOR PURIFICATION OF INDUSTRIAL WASTE WATER,
Elkem-Spigerverket A/S, Oslo (Norway). (Assignee).
K. W. Jahnsen.

U.S. Patent No. 3,950,250, 3 p, 1 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 945, No 2, p 824, April 13, 1976.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, *Water purification, Water pollution treatment, Water pollution control, Water quality control, *Oxidation, Flocculation, Separation techniques, Hydrogen ion concentration.
Identifiers: Cyanides, Metal-working industrial plants.

The required amounts of sodium hypochlorite or gaseous chlorine for oxidation of the cyanides along with alkali for raising the pH to that level which will give optimum reaction conditions are added to the waste water in conventional amounts and manner and then the water is conducted to a combined prereaction and flocculation container in which the mechanical flocculation and oxidation of cyanides takes place simultaneously. The pH of the waste water in the chamber for best results is usually in the range of 10 to 11. The prereaction and flocculation container is provided with an inner and an outer compartment. The waste water is fed into the inner compartment where it flows through the compartment and into the outer compartment where it flows countercurrently to the direction of flow in the first compartment. Conventional agitation means are provided in the inner compartment. The speed of agitation and retention time in the container as determined by rate of flow of the waste water are adjusted to obtain the optimum reaction conditions for the oxidation or decomposition of the cyanides and flocculation of suspended material. (Sinha - OEIS)
W76-09861

SUPPORTED SEMI-PERMEABLE MEMBRANES,
Daicel Ltd., Osaka (Japan). (Assignee).
For primary bibliographic entry see Field 3A.
W76-09863

SEMIPERMEABLE MEMBRANE AND PROCESS FOR THE PREPARATION THEREOF,
Daicel Ltd., Osaka (Japan). (Assignee).
For primary bibliographic entry see Field 3A.
W76-09864

APPARATUS AND METHOD FOR RECOVERING PURE WATER FROM NATURAL SOURCES AND INDUSTRIAL POLLUTED WASTE SOURCES,
For primary bibliographic entry see Field 5G.
W76-09867

METHOD AND APPARATUS FOR CONVERTING SALINE WATER TO FRESH WATER,
For primary bibliographic entry see Field 3A.
W76-09871

METHOD AND APPARATUS FOR THE CONVERSION OF AN AQUEOUS SCALE-FORMED LIQUID,
For primary bibliographic entry see Field 3A.
W76-09872

METHOD OF OPERATING A PURIFYING PLANT AND TANK FOR PRACTICING SAID METHOD,
Menzel and Co., Stuttgart (West Germany). (Assignee).
R. Porsch.
U.S. Patent No. 3,951,758, 4 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1333, April 20, 1976.

Descriptors: *Patents, *Waste water treatment, *Water purification, Water pollution control, *Water pollution treatment, Water quality control, Sludge, Oxygenation, Ventilation, Air circulation, Application equipment.
Identifiers: Revolving tanks.

A method of operating a round reactivating tank for a purifying plant is described. The tank has a vertical axis and is adapted to receive a sludge-water mixture to be purified. The steps of the method are: revolving in the tank the sludge-water mixture to be purified; supplying the reactivating sludge flakes of the mixture in the tank with oxygen independently of revolving by introducing compressed air into the mixture along radial lines from adjacent the outer circumference inward toward the center; and increasing the volume of air outward from the center toward the circumference to force the mixture in the tank to carry out and maintain for a desired time a circular flow. The flow is substantially coaxial with the vertical axis and has a radially inward directed component adjacent the bottom of the tank and deflecting upward by a centrally positioned inclined surface. (Sinha-OEIS)
W76-09873

FURNACE FOR THERMAL TREATMENT OF LIQUID INDUSTRIAL WASTE WATERS CONTAINING TOXIC ORGANIC IMPURITIES (PECH' DLYA TERMICHESKOGO OBEZVREZHIVANIYA ZHIDKIKH PROMYSHLENNYKH STOKOV S TOKSICHESKIMI ORGANICHESKIMI PRIMESYAMI),
V. I. Brazhnikov, and P. A. Tikhanovskiy.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-783 850, $3.50 in paper copy, $2.25 in microfiche. Russian Patent No. 286983, 1971. 3 p, 4 fig. Translation prepared for Army Foreign Science and Technology Center, Charlottesville, Va.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Chemical wastes, *Water pollution treatment, *Water pollution control, *Water quality control, Gases, Heat, Condensation.
Identifiers: Combustion, Furnaces, Atomizing.

A furnace is described for thermal treatments of industrial liquid waste with toxic organic impurities. It consists of a vertical shaft with channels for introducing fuel and air, units for heating and atomizing industrial wastes and for cooling and removal of gaseous combustion products. The effectiveness of the furnace is achieved by installing units for separate introduction of fuel into the shaft and combustion units and by using additional combustion chambers which form individual zones along the height of the furnace. Units for atomizing industrial waste waters, for example atomizers, are situated along the perimeter at different heights of the furnace shaft and the liquid being atomized is directed opposite to the gas stream at an angle to the vertical. The furnace consists of a vertical shaft with independent combustion chambers situated tangentially and furnished with short-flame burners. The industrial liquid waste heated to a temperature of 70-95 deg C is fed under pressure into the atomizing sprayers located in two decks along the furnace height. Air is introduced in the form of fine jets. The burning and removal of impurities by calcination of industrial waste liquids present in vapor form is accomplished. The products of combustion are removed from gas outlet and low-melting salts which precipitate during the treatment process are melted and periodically discharged. On cooling the gases leaving the furnace condenses and the moisture can be used again. (Sinha-OEIS)
W76-09875

PREPARATION OF REVERSE OSMOSIS MEMBRANES BY COMPLETE EVAPORATION OF THE SOLVENT SYSTEM,
Dept. of the Interior, Washington, D. C.
For primary bibliographic entry see Field 3A.
W76-09876

REVERSE OSMOSIS PROCESS USING CROSS-LINKED AROMATIC POLYAMIDE MEMBRANES,
Department of the Interior, Washington, D. C.
For primary bibliographic entry see Field 3A.
W76-09877

CALCULATION OF WATER TEMPERATURES IN CLEAR LAKE, IOWA,
Ichthyol. Assoc., Berwick, Pa. Icthyological Associates, Inc., Berwick, Pa.
For primary bibliographic entry see Field 5B.
W76-09879

THE COANDA EFFECT OIL/WATER SEPARATOR: A DEVELOPMENT STUDY,
Navy Civil Engineering Lab., Port Hueneme, Calif.
For primary bibliographic entry see Field 5G.
W76-09890

PRELIMINARY DESIGN OF A COMPREHENSIVE WASTE OIL PROCESSING FACILITY,
Environmental Quality Systems, Inc., Rockville, Md.
G. D. Gumtz, and E. J. Martin.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 461, $6.00 in paper copy, $2.25 in microfiche. Environmental Protection Agency Report No. EPA-670/2-75-056, May 1975. 133 p, 20 fig, 44 tab, 14 ref, append.

Descriptors: *Oil industry, *Waste water treatment, Facilities, *Pollutant identification, *Recycling, *Resources development, *Oil pollution, Pollutants, Maryland, Metals, Disposal, Sulfates, Halides, Quality control, *Treatment facilities.
Identifiers: *Waste oils, Oil recoveries.

A preliminary design was performed for a comprehensive waste oil recovery and disposal facility for the State of Maryland. The base for this design was an annual state-wide waste oil generation of 22,000,000 gallons which includes all known waste oil sources. With a 90% stream factor, feed to the plant is 66,000 gallons per day. The facility contains two major sections: (1) tank farm and (2) process plant. The tank farm is, in turn, composed of three major subsections: (1) receiving, (2) primary waste oil storage, and (3) product tankage. The comprehensive process plant has been designed to accept a wide range of waste oil types (crankcase, hydraulic, transformer, edible, etc.) and, potentially, provide multiple product oils (fuel, re-refined industrial, etc.). For this, it contains three major subsections: (1) adsorbent treatment, (2) solvent extraction, and (3) incineration. Basic processing will involve, in order, reagent addition and settling, flash distillation, adsorbent treatment followed by filtration, or sovent extraction followed by solvent recovery. Capital cost for this full-scale comprehensive facility is estimated at $5,700,000. Excluding collection, costs, overall system management, and major research and development, annual operating costs are estimated at about $2,331,000. Approximately 16,000,000 gallons of fuel oils and 500,000 gallons of lube oil base stock will be produced by this facility each year. Waste products generated include heavy metal particulates and calcium halides and sulfate. (Sinha-OEIS)
W76-09894

DEVELOPMENT OF A BATCHWISE IN-SITU REGENERATION TYPE SEPARATOR TO REMOVE OIL FROM OIL-WATER SUSPENSIONS,
Hydronautics, Inc., Laurel, Md.
For primary bibliographic entry see Field 5G.
W76-09895

INSECT GROWTH REGULATORS FOR THE CONTROL OF AQUATIC MIDGES,
California Univ., Riverside. Dept. of Entomology.
For primary bibliographic entry see Field 5G.
W76-09997

5E. Ultimate Disposal Of Wastes

MARINE SEWAGE DISPOSAL DEVICE,
For primary bibliographic entry see Field 5D.
W76-09418

SEPTIC TANK SYSTEM,
For primary bibliographic entry see Field 5D.
W76-09426

WASTE TREATMENT PLANTS,
Foster Wheeler John Brown Boilers Ltd., London (England). (Assignee).
R. J. Davies, and D. G. Blows.
United States Patent 3,954,605. Issued May 4, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 1, p 243, May, 1976. 1 fig.

Descriptors: *Patents, *Waste disposal, *Incineration, Domestic wastes, *Sewage treatment, Flocculation, *Waste water treatment.
Identifiers: *Shipboard wastes.

A method was patented for disposing of sewage wastes and domestic solid materials on a ship or in a remote land site using a fluidized bed incinerator. The solid material may be combustible, noncombustible, or a mixture. The sewage wastes first enter a reception zone. After collection in the reception zone, the wastes are passed to a macerator. Flocculation aids are introduced to the sewage wastes after maceration. The sewage wastes are passed to a zone for pressure aeration where air is dissolved into them under pressure. The sewage wastes are then passed to another zone and fine air bubbles are liberated, transporting solid particles which have flocculated to the zone's surface and separating the sewage into a clarified liquor and a pulp, which can be fed to the fluidized bed incinerator. The clarified liquor is disinfected and then reused on the ship or in the remote land site or passed to the incinerator. Part of the pulp is returned to the pressure aeration zone. The pulp not returned is passed to a feeding zone of the incinerator. The solid materials are passed to a pulverization zone and converted to incineratable form which can be fed to the incinerator's fluidized bed region. Combustion conditions are provided in the fluidized bed incinerator. The solid materials are passed to the feeding zone. The pulp and the solid materials are mixed in the feeding zone of the incinerator. This mixture is fed directly to the incinerator's fluidized bed region. Any oil waste from the remote land site or ship is introduced into the fluidized bed incinerator. (Snyder-FIRL)
W76-09427

PROCESS AND APPARATUS FOR THE INCINERATION OF AQUEOUS SEWAGE SLUDGE,
Myrens Verksted A/S, Oslo (Norway). (Assignee).
P. A. Loken.
United States Patent 3,954,069. Issued May 4, 1976. Official Gazette of the United States Patent Office, Vol. 946, No. 1, p 74-75, May, 1976. 1 fig.

Descriptors: *Patents, *Incineration, *Sludge treatment, Sewage treatment, Solids removal, Dewatering, Odors, *Waste water treatment.

A process and related equipment have been patented for incinerating aqueous sewage sludge, such as from community sewage treatment plants. The aqueous sewage sludge is mechanically dewatered to produce a wet sludge with high solids content. This wet sludge is indirectly heated and substantially dried in a heated drier, producing an exhaust gas containing water vapor and a dried sludge. The dried sludge is conducted to an incinerator for solid refuse. The exhaust gas is conducted through a condenser, condensing the water vapor and removing it, substantially drying the exhaust gas. This dry exhaust gas is conducted into the incinerator's combustion chamber. The exhaust gas is deodorized by heating with the aid of the hot combustion gases in the incinerator. (Snyder-FIRL)
W76-09428

SEWAGE SEPTIC SYSTEM FOR A PLURALITY OF DRAIN FIELDS,
Langley Hill Quarry, Woodside, Calif. (Assignee).
For primary bibliographic entry see Field 5D.
W76-09430

CARBON WASTEWATER TREATMENT PROCESS,
Jet Propulsion Lab., Pasadena, Calif.
For primary bibliographic entry see Field 5D.
W76-09441

A COMPARISON BETWEEN THE EFFICACY OF SUBMARINE OUTFALL DISPOSAL OF ADVANCED PRIMARY EFFLUENT AND CONVENTIONAL TREATMENT,
Trieste Univ. (Italy). Istituto di Idraulica e Costruzioni Idrauliche.
R. Olivotti.
Berichte der Abwassertechnischen Vereinigung e.V., No. 28, p 215-231, 1976. 2 tab, 55 ref.

Descriptors: *Waste water treatment, *Waste water disposal, *Pre-treatment(Water), *Outfall sewers, Nutrient removal, Viruses, Biochemical oxygen demand.
Identifiers: Marine outfalls.

The optimum choice of systems for treating and disposing of waste water in coastal areas depends on local circumstances. Types of systems frequently used include a long outfall preceded by pretreatment, a long outfall preceded by primary treatment, and biological treatment and chlorination followed by discharge near the coast. Advances which do not substantially change the problem's financial dimensions include the use of advanced primary treatment and following chlorination with dechlorination after biological treatment. Either of the latter two systems can usually meet a requirement that the 80th percentile be less than or equal to 100 fecal coliforms/100 cu cm. Viruses must also be considered as contaminats. Both of these systems can provide satisfactory protection against pollution by viruses, but outfalls must be longer than the current usual length. A long outfall preceded by advanced primary treatment is more effective against eutrophication. Both systems can result in satisfactory water quality near the outlet. Where the minimum prescribed treatment is not higher than advanced primary, either system may be used. The long outfall method, however, cannot be used where biochemical oxygen demand(BOD) standards are strict. Costs of the two systems are usually of the same order. Long outfalls preceded by advanced pretreatment are often preferable when concentrations of dissolved persistent toxicants meet specific standards and conventional 'full' treatment is not legally mandatory. (Snyder-FIRL)
W76-09448

RADIATION FOR A CLEAN ENVIRONMENT.
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5D.
W76-09512

TYPES AND TREATMENT OF SEWAGE SLUDGES PRACTICE IN THE FEDERAL REPUBLIC OF GERMANY,
Stuttgart Univ. (West Germany). Institut fuer Siedlungswasserbau und Wassergute-wirtschaft.
For primary bibliographic entry see Field 5D.
W76-09513

METHODS FOR REDUCING THE INFECTION HAZARD OF WASTE-WATER SLUDGE,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W76-09514

RECENT ADVANCES IN THE TREATMENT OF SOLID WASTES,
Technion-Israel Inst. of Tech., Haifa.
For primary bibliographic entry see Field 5D.
W76-09553

NUMERICAL SIMULATION OF WASTE MOVEMENT IN STEADY GROUNDWATER FLOW SYSTEMS,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W76-09564

EFFECTS OF DISCHARGE FROM A DREDGE SPOILS SITE ON CARROLL ISLAND, MARYLAND,
Edgewood Arsenal, Aberdeen Proving Ground, Md. Biomedical Lab.
For primary bibliographic entry see Field 5C.
W76-09647

DEWATERING OF SEWAGE SLUDGE VIEWED AS PART OF THE PURIFICATION PROCESS -- PLANNING CRITERIA (KLAERSCHLAMMENTWAESSERUNG ALS TEIL DER GESAMTEN KLAERAUFGABE BETRACHTET -- PLANUNGSKRITERIEN),
For primary bibliographic entry see Field 5D.
W76-09681

DEVELOPMENT OF EDINBURGH'S SEWAGE DISPOSAL SCHEME,
Lothian Regional Council (Scotland).
For primary bibliographic entry see Field 5D.
W76-09707

THE DESERT WAR ON POLLUTION,
For primary bibliographic entry see Field 5D.
W76-09711

A GUIDE TO THE SELECTION OF COST-EFFECTIVE WASTEWATER TREATMENT SYSTEMS,
Bechtel, Inc., San Francisco, Calif. Environmental Water Projects Dept.
For primary bibliographic entry see Field 5D.
W76-09772

WASTEWATER SLUDGE UTILIZATION AND DISPOSAL COSTS,
Gates (W. E.) and Associates, Inc., Fairfax, Va.
For primary bibliographic entry see Field 5D.
W76-09773

COSTS OF WASTEWATER TREATMENT BY LAND APPLICATION,
Metcalf and Eddy, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5D.
W76-09774

ORGANIC SEDIMENT MODEL FOR WASTE-WATER OUTFALL,
Tetra Tech, Inc., Lafayette, Calif.
For primary bibliographic entry see Field 5B.
W76-09951

PARTICLE-LADEN JETS WITH APPLICATION TO OCEAN DUMPING,
Delaware Univ., Newark. Dept. of Civil Engineering and Marine Studies.
For primary bibliographic entry see Field 5B.
W76-09959

5F. Water Treatment and Quality Alteration

VAN CLARIFIES SLUDGE OPTIONS,
Water and Wastes Engineering, Vol. 13, No. 4, p 51, April, 1976.

Descriptors: *Water treatment, *Sludge treatment, Clays, *Polymers, Dewatering, Sludge disposal.
Identifiers: *Alum, *Clay-polymer sludge.

A clay-polymer clarification program developed by Nalco Chemical Company as an alternative to alum clarification was tested at two water treatment plants in Birmingham, Alabama. Sludge produced from clay-polymer clarication is much lower in volume than the sludge produced from alum clarification because no fluffy hydrated aluminum hydroxide is produced in the process. The clay-polymer sludge dewaters easily by drainage and evaporation; no chemically bound water is formed in the process. The city authorized Nalco to use its water resources management van to conduct evaluations of the clay-polymer program. The van contains a laboratory equipped with a Zeta meter, spectrophotometer pH instruments, turbidimeter, and colorimetric instrumentation. The results of the tests showed that the product water was of excellent quality, well within the city's standards, and that the process produced a low volume of sludge with good handling and dewatering properties. (Orr-FIRL)
W76-09438

CURRENT TECHNOLOGY AND ADVANCES IN TRUE RE-USE OF EFFLUENTS,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5D.
W76-09515

PUBLIC HEALTH ASPECTS OF WASTE-WATER TREATMENT,
Royal Veterinary and Agricultural Coll., Copenhagen (Denmark). Dept. of Veterinary Virology and Immunology.
For primary bibliographic entry see Field 5D.
W76-09516

THE NEED FOR THE USE OF HIGH-LEVEL RADIATION IN WATER TREATMENT AND IN WASTE-WATER (SEWAGE) TREATMENT,
Aqueonics, Inc., Los Altos, Calif.
For primary bibliographic entry see Field 5D.
W76-09518

PRACTICAL APPLICATION OF THE GERMICIDAL POWER OF ULTRAVIOLET IRRADIATION TO DRINKING-WATER, (IN FRENCH),
Institut Pasteur, Paris (France). Medical Virology Lab.
J. Maurin, L. P. Mazoit, A. Dodin, and G. Escallier.
Bull W H O. 51(1), p 35-40, 1974.

Descriptors: Disinfection, *Ultraviolet radiation, Potable water, Public health, *Bacteria Enteric virus, Pesticides, Streptococcus, *Water treatment.
Identifiers: Colibacilli, Picornavirus, Poliovirus, *Vibrio-Cholerae.

The possibilities of using UV irradiation for disinfecting water, especially drinking-water are yet underestimated. Continuous and intermittent bacteriological trials on filtered and unfiltered river water showed that UV-rays are effective against colibacilli and fecal streptococci but less active against sulfite-reducing clostridia. Vibrio cholerae was completely inactivated by the procedure, and enteroviruses, such as poliovirus, were completely or almost completely inactivated.--Copyright 1975, Biological Abstracts, Inc.
W76-09646

REPORT TO THE CONGRESS BY THE NATIONAL COMMISSION ON WATER QUALITY,
National Commission on Water Quality, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-09663

MONITORING AND AUTOMATIC FILTER CONTROL OF THE DREIS-TIEFENBACK TREATMENT PLANT (BETRIEBSUEBERWACHUNG UND AUTOMATISCHE FILTERSTEUERUNG DER AUFBEREITUNGSANLAGE DREIS-TIEFENBACH),
H. Roesel, and H. Stein.
Wasser und Boden, Vol. 28, No. 4, p 76-79, 1976. 5 fig, 1 ref.

Descriptors: *Treatment facilities, *Water treatment, *Filtration, *Water works, *Control, Filters, Aeration, Chlorination, Oxygenation, *Monitoring, Automatic control.

The Dreis-Tiefenbach waterworks and its automatic filter control are described. Raw water obtained from a barrage and from groundwater is first aerated for oxygenation and for the partial removal of carbon dioxide. Suspended matter, iron, and manganese are removed in a first filter stage that uses such chemicals as aluminum sulfate, potassium permanganate, and aqueous lime. Quartz gravel is used for filtration. The water is treated with potassium permanganate, carbon dioxide and lime in a second filter stage composed of Jurassic chalk. In a final step, the water is chlorinated before distribution. (Takacs-FIRL)
W76-09679

THE CHEMISTRY OF OZONE IN THE TREATMENT OF WATER,
Hebrew Univ., Jerusalem (Israel). Graduate School of Applied Science and Technology.
M. Peleg.
Water Research, Vol. 10, No. 5, p 361-365, 1976. 1 tab, 50 ref.

Descriptors: *Ozone, *Water treatment, *Waste water treatment, *Organic compounds, *Kinetics, Analytical techniques, Phenols, Water chemistry, Reviews.
Identifiers: Hydroxyl radicals.

A review is presented of the chemistry of ozone in water and the potential disinfection efficiencies of ozone and its probable dissociation species in water. Ozone, an unstable gas that decomposes slowly in the gaseous phase to ordinary oxygen, will decompose at a greatly accelerated rate under thermal conditions. Knowledge of the mechanism and kinetics of the dissociation of ozone in water is uncertain. On the basis of several studies reviewed, the possible species to be found in aqueous ozone solution are 03, 0H, H02, 0-, 03-, and possibly the free oxygen atom if ozone decomposes before reacting with the water. Ozone has one of the highest oxidation potentials known, 2.07 V in acidic solutions and 1.24 V in basic solutions. Similar reactions of the hydroxyl radical and ozone have been noted. Both produce similar effects in the reduction of the organic carbon content of waste water effluents. Additionally, the ozonization of phenol in aqueous solution and the oxidation of phenol by OH both produce catechol and o-quinone as intermediate products. Investigations suggest that the dissociation products may be more powerful oxidation agents than ozone itself. Further experimental work is being performed in order to make more definitive statements about germicidal properties of ozone and its dissociation species in water. More work is needed on the effect of pH changes and increased catalytic decomposition of ozone on its disinfection ability. (Kramer-FIRL)
W76-09684

MODERN TECHNIQUES OF WASTE DETECTION,
East Worcestershire Waterworks Co., Bromsgrove (England).
R. H. Burch, and K. C. Marlow.
Water Services, Vol. 81, No. 960, p 179-182, March, 1976. 3 fig.

Descriptors: *Water treatment, *Distribution systems, Analytical techniques, Data collections, Sands, Flow rates, Pressure, Computers, Pollutant identification, Water supply, *Water conservation, *Waste identification.

The East Worcestershire Waterworks Company supplies water to a mixed rural and industrial community of about 300 sq mi. Until recently, sand from the wells from which most of this water is obtained entered the distribution system and eventually contributed to waste problems. Waste is defined as water supplied that cannot be accounted for in terms of legitimate domestic, metered, or bulk consumption. Waste dropped from 30% to 26% between 1963 and 1970, due to various water conservation measures. A new waste detection system was instituted in which a computer is used to compare flows at various points in the system. The system was divided into zones. Unusual demand in a zone is indicated by deviation of the solution of the zonal equation from known limits; sudden demands can be located within minutes. Every 24 hr, minimum night line figures are logged for all zones, to detect gradual waste increases. The equations consider losses or gains in reservoir levels in determining water consumption. Flow data is transmitted digitally, in units of 4546 liters for major source works and 455 liters for smaller flows. This system has reduced waste from 25% to 19% since 1971. The effect of pressure on waste level is also being studied. (Snyder-FIRL)
W76-09685

OPERATION OF OZONE TREATMENT APPARATUS (OZONE SHORI SOCHI NO UNTEN),
K. Takaya.
Suido Kyokai Zasshi (Journal of Japan Water Works Association), No. 497, p 38-49, February, 1976. 23 fig, 5 tab, 8 ref.

Descriptors: *Odor, *Ozone, *Water treatment, *Potable water, Rivers, Treatment facilities, Laboratory tests, Pilot plants, Costs, Waste water treatment.
Identifiers: *Japan, Deodorization.

The ozone treatment facility at the Kurashiki Water Works, Japan, for the deodorization of undesirable odors in the drinking water is described. The actual treatment facility was constructed after basic data collection at an experimental plant. The facility treated a maximum of 30,000 cu m/day river water which was first treated by a rapid filtration method, and entered into an ozone reaction bath. The residence time of water in the reaction bath was 3.3 minutes and a diffusion method for the ozone and water contact was employed. The

ozone absorption efficiency and the ozone level in the exhaust gas from the reaction bath agreed in both the experimental plant and the actual facility; ozonized air flow rate was 252 cu m/hr. With the ozone concentration in the flowing air at 1.5 ppm, ozone absorption efficiency by water was about 70% and ozone concentration in the exhaust gas was about 1.6 g/cu m air. Residual ozone from the reaction bath was treated with activated carbon. The dissolved ozone concentration in the water during winter treatment was almost twice that of summer treatment, due to water temperature. Treated water was stored in a pool before being sent into the water main and no residual ozone was found in the water of the water main. The deodorization effect achieved was a decrease in the threshold odor unit from 10 for the pre-treatment to 4 after the treatment. Operational costs of deodorization were 1 cent per cu m water. (Katayama-FIRL)
W76-09713

HYDRODYNAMIC SEPARATION OF SOLIDS FROM SOLID-LIQUID MIXTURES,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5D.
W76-09716

HYGIENIC ASSESSMENT OF CHANGES IN MINERAL WATER PROPERTIES DURING ITS TREATMENT FOR USE IN INTERNAL BALNEOTHERAPEUTIC PROCEDURES, (IN RUSSIAN),
Stavropol Territorial Medical Inst. (USSR).
For primary bibliographic entry see Field 5C.
W76-09795

DETERMINATION OF FLUORINE IN DRINKING WATER WITH A CERIUM(III)- OR LANTHANUM ALIZARIN COMPLEX, (IN RUSSIAN),
Research Inst. of Public Water Supply Water Purification, Moscow (USSR).
For primary bibliographic entry see Field 5A.
W76-09796

ON THE EXTERMINATION OF POLYCLADS: CALCIUM HYPOCHLORITE (CAOC12) TREATMENT IN THE PERIOD OF HIGH WATER TEMPERATURE, (IN KOREAN),
For primary bibliographic entry see Field 5C.
W76-09801

THE MERCURY CONTENT OF INDUSTRIAL FISH PRODUCTS: ITS RELATIVE VARIATION WITH THE TREATMENT (COOKING IN SALT WATER, PICKLING AND FISH PRODUCTION), (IN SPANISH),
Instituto Espanol de Oceanografie, Madrid (Spain).
For primary bibliographic entry see Field 5C.
W76-09802

DOMESTIC WATER FILTRATION APPARATUS,
Dynek Corp., Port Chester, N.Y. (Assignee).
E. Stern.
U.S. Patent No. 3,950,253, 5 p, 3 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 945, No 2, p 825, April 13, 1976.

Descriptors: *Patents, *Water purification, *Water treatment, *Filtration, Domestic water, Potable water, Water quality, Odor, Demineralization, Application equipment, Bacteria.

The invention provides an improved water filtration apparatus which is sufficiently economical in cost and operation to be suitable for domestic use. It has greatly improved effectiveness, and will substantially reduce the bacterial count of drinking water. It also has active filter media which are effective in removing all of the different types of major water contaminants. The apparatus includes a container for treating water and has a reservoir for storing untreated water. A pump has an inlet connected to pump water from the bottom of the reservoir and an outlet connected within the container to the inlet of a filter device also located within the container. The filter device includes an integral outlet spout for discharging the filtered water over the upper edge of the container. (Sinha - OEIS)
W76-09862

EXPERIMENTAL EFFECT OF BORON ON ANTICARIOUS ACTION OF FLUORINE IN DRINKING WATER, (IN RUSSIAN),
Meditsinskii Institut, Kiev (USSR).
R. D. Gabovich, and G. A. Stepanenko.
Gig Sanit. 38(12), p 20-22, 1973.

Descriptors: *Boron, *Fluorine, Potable water, Trace elements, Public health, *Water treatment.
Identifiers: *Caries prevention, Dental health.

Addition of the trace element B to drinking water with low (0.1 mg/l) and optimal (1.5 mg/l) concentrations of F raised the incidence of tooth caries, increased the solubility of enamel in lactic acid solutions and diminished the assimilation of F by teeth and bones (rat).--Copyright 1975, Biological Abstracts, Inc.
W76-09885

5G. Water Quality Control

PHOSPHATE REMOVAL--TACKLING EUTROPHICATION FROM THE OTHER SIDE,
For primary bibliographic entry see Field 5D.
W76-09436

WORKING TOWARDS TOUGHER ODOUR CONTROL STANDARDS.
Process Engineering, p 95, February, 1976.

Descriptors: Odor, *Sewage treatment, *Waste water treatment, Municipal wastes, Food processing industry, Ozone, Oxygen, Standards.
Identifiers: Odor control, Odor control standards.

Due to anticipated stricter standards of control for odors from industrial and municipal sources, new technology is being considered in the United Kingdom. Available new equipment includes the high-efficiency KT fume scrubber from Plastic Constructions, a series of ozonators developed by Wallace and Tiernan, and Aeronca's closed-circuit drying system based on its Impinjet scrubber which could prove suitable for the control of escaping dust, vapor and odor. Detailed is the development of the Var 'wet' odor oxidation process using ozone. By scrubbing foul air with ozonated water, oxidation occurs and contact time is reduced to three seconds compared with 30 seconds for 'dry' ozonation. Ozone does not need to be applied in excess. The Var system is currently being installed at two sites near Edinburgh--the Seafield sewage treatment works and Leith Docks. It will be used to treat odors from sludge storage tanks at about 25,000 cu m/hr. The system is also suitable on an industrial scale for gases extracted from individual processes or as a high-volume polishing process on air extracted from an entire facility. A pilot scale test plant has been operating for over a year, treating the very difficult odor from a fish meal plant; performance has been reported to be very encouraging. (Kramer-FIRL)
W76-09446

MUNICIPAL WATERSHED MANAGEMENT: WHAT ARE THE OPPORTUNITIES,
Northeastern Forest Experiment Station, Pennington, N. J.
For primary bibliographic entry see Field 4D.
W76-09472

WATER UTILIZATION AND SOIL SALINITY: CONTROL IN ARID ZONE AGRICULTURE,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
For primary bibliographic entry see Field 3C.
W76-09482

COMBINED EFFECTS OF RADIOACTIVE, CHEMICAL AND THERMAL RELEASES TO THE ENVIRONMENT,
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5C.
W76-09490

COST EFFECTIVENESS OF RELEASE PREVENTION CONTROLS FOR TRITIUM AND KRYPTON-85,
International Atomic Energy Agency, Vienna (Austria).
J. J. Cohen.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/17. p 285-298, 6 fig, 2 tab, 18 ref.

Descriptors: *Environmental effects, *Costs, *Control, Radioactivity effects, *Tritium, Krypton, Nuclear reactors.
Identifiers: *Krypton-85.

The study evaluates and compares potential effects of environmental releases of tritium and krypton 85 with the objective of placing exposure risks in perspective so that costs for release prevention may be related to and made commensurate with the potential hazard and so that cost effectiveness for controls may be established on an objective basis. Based on predicted environmental levels for both nuclides, the dose rate for the year 2000 is predicted. Tritium dose effects will be almost entirely due to natural sources and the residual tritium from atmospheric explosive testing. Any effort to minimize tritium exposure would have to be aimed at reducing tritium effluent. Since environmental krypton 85 is entirely anthropic, proper control measures to minimize its release might produce substantially lower future population dose levels over the next several decades. (See also W76-09490) (Chilton-ORNL)
W76-09506

FIELD DRAINAGE WITH MANIFOLD WELL POINTS,
Agricultural Research Service, Weslaco, Tex.
R. J. Rektorik.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 1, p 81-84, January-February 1976. 2 fig, 4 tab, 6 ref.

Descriptors: *Drainage systems, *Drainage wells, *Rio Grande River, *Texas, Water quality control, Aquifers, Plastic pipes, Well screens, Water table, Dewatering, Drawdown, Drainage, On-site investigations, Leaching, Cost analysis, Depth, Transmissivity, Storage coefficient, Pumping, Electric power costs, Centrifugal pumps, Reclamation, Root zone, Hydraulic gradient, Cathodic protection, Corrosion, Electrolysis.
Identifiers: *PVC, *Manifold well point system.

A field study of a manifold well point system was conducted in a highwater table, shallow aquifer in the lower Rio Grande Valley of Texas. The objectives of the study were to determine how effectively well point drainage systems work, how long they would last, their design, and their installation and operational cost. PVC pipe was used for the wells and manifold piping, and plastic screens were used for the well points. These materials

offer much resistance to both corrosion and electrolytic problems and, as such, show promise for a long service life. The cost of well point systems at about $250/ha is materially lower than the $370-$500/ha for pipe drain systems. The design of well point systems depends on variations in aquifer parameters. Straight line configurations are most economical to construct but do not produce the most uniform drawdown. Water removal of about 0.26 l/s/ha provides adequate control of the water table in the study area and permits leaching of salts by irrigation or rainfall. (Visocky-ISWS)
W76-09586

AN ECONOMIST'S VIEW OF THE OCEANS,
Yale Univ. New Haven, Conn.
For primary bibliographic entry see Field 6E.
W76-09617

THE DESIGN OF WATER QUALITY MANAGEMENT PROJECTS WITH INADEQUATE DATA,
Oklahoma Univ., Norman.
G. W. Reid.
In: Design of Water Resources Projects with Inadequate Data, Vol. 2, Proceedings of the Madrid Symposium, June 1973; Unesco - WMO - IAHS, Unesco - OMM - AISH, 1974, p 350-363. 3 fig, 2 tab, 7 ref.

Descriptors: *Water quality, *Management, *Model studies, *Water pollution control, Projects, *Design, Equations, Decision making, Simulation, Equations, Systems analysis.
Identifiers: *Inadequate data, Submodels, Biodegradable model, Thermal model, Dispersed pollution model, Upstream use model, Streeter-Phelps equation.

One of the increasingly important elements in the design of water resource projects is the management of quality; an almost purely hydrological and hydraulic technology is being expanded to include the environmental and ecological impact areas and systems. Besides the interrelationships, flows and transports, the impacts on the living and nonliving water and peripherral environments need to be understood; ecological and water quality models must be developed. Unfortunately, there is rarely adequate data to properly describe these interrelationships. The methodology used for hydrological studies involving inadequate data such as the transfer of observed points to points of interest, short term intense studies, or use of simulation techniques, are being used in quality management modeling. In understanding data requirements using the system approach, the sequence of events are: (1) problem formulation; (2) symbolic modeling; (3) data collection; (4) analysis; and (5) design. Frequently, the order is changed. The complexities arise from an imperfect understanding of hydraulic, hydrological, chemical, biological, and ecological processes. Recognized is the superiority of an explicit quantifiable data and models over intuitive models and hunches. Suggested is a mental model, based on the mixture of incomplete information and intuition similar to most political decision making. A mathematical model deals with the same incomplete information available to an intuitive model, but through organization of information from many different sources into a closed loop. (Bell-Cornell)
W76-09623

NEPA AND A STATE'S ROLE IN WATER RESOURCES MANAGEMENT,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 6E.
W76-09627

REPORT TO THE CONGRESS BY THE NATIONAL COMMISSION ON WATER QUALITY,
National Commission on Water Quality, Washington, D. C.
March 18, 1976. 90 p.

Descriptors: *Federal government, *Water quality act, *Water quality control, Standards, Wastes, Water treatment, Irrigation, *Water quality standards.
Identifiers: *Public Law 92-500, *Interim law modification.

Experience during the three and one half years since enactment of Public Law 92-500, and the Commission's studies and evaluations' indicate that the Law requires 'mid-course adjustments' to keep the nation on a realistic course toward the objective of restoring and maintaining the physical, chemical, and biological integrity of the nation's waters. Recommendations include: (1) Maintain the July 1, 1977 deadline for compliance with uniform treatment requirements by both industry and publicly owned treatment works but with some flexibility, (2a) Maintain 1983 water quality goal, while postponing the 1983 requirements for application of uniform technologies five to ten years, (2b) Postpone, for not more than 10 years, 1983 interim water quality goal, and seek general application of the 1977 requirements, (3) Decentralize regulatory and administrative functions of the national programs by selective certification of states, (4) Stabilize the Federal construction grants program by assuring 75 percent Federal financing for priority treatment needs at a fixed amount, (5) Redefine the goal of elimination of discharge of pollutants as one stressing conservation and reuse of resources, (6) Authorize flexibility in applying control or treatment measures to irrigated agriculture after an inventory of the problem, and (7) support salinity alleviation projects to reduce salt loads from sources other than man's activity. (Heiss-NWWA)
W76-09663

METHODOLOGIES FOR THE DETERMINATION OF STREAM RESOURCE FLOW REQUIREMENTS: AN ASSESSMENT,
Utah State Univ., Logan. Dept. of Wildlife Science.
For primary bibliographic entry see Field 6G.
W76-09666

EROSION CONTROL DURING PIPELINE CONSTRUCTION,
Yule, Jordan and Associates, Camp Hill, Pa.
L. R. Robinson, Jr.
In: National Symposium on Urban Rainfall and Runoff and Sediment Control; Proceedings of symposium held July 29-31, 1974, Lexington, Kentucky. Report UKY BU106, p 175-182, October 1974. 16 fig, 5 ref.

Descriptors: *Erosion control, *Pipelines, *Construction, *Pennsylvania, Sedimentation, Erosion, Regulation, Silts, Sediments, Filters, Channels, Spoil banks, Rainfall, Vegetation.
Identifiers: Straw filters, Stream crossings.

On September 21, 1973, the Pennsylvania Environmental Quality Board adopted an 'Implementation Plan and Regulations Dealing with Erosion and Sedimentation Control' which applies to all earthmoving activities in Pennsylvania. Federal and State criteria were used to develop an erosion and sedimentation control plan, as required by the new Pennsylvania regulations, to be used during pipeline construction during the 1973 construction season. Progress of construction and effectiveness of erosion control structures were monitored and pictorially recorded throughout the construction season. As evidenced by photographs and turbidity measurement, it was found that in most situations very little sediment left the site of pipeline construction. Straw bales placed across small streams and draws at critical road crossings and where bodies of water were to be protected, judicious use of pipe trenches and roadside ditches as sediment traps, utilization of the roughness and porosity of construction in the right of way as a runoff retardant, and vegetation alongside the right of way as a sediment filter provided satisfactory erosion control. (See also W76-09729) (Sims - ISWS)
W76-09743

WATERSHED MANAGEMENT AND SEDIMENT CONTROL IN MONTGOMERY COUNTY,
Environmental Protection Agency, Montgomery County, Md. Storm Water Management Section.
For primary bibliographic entry see Field 4D.
W76-09748

MUNICIPAL STORM WATER MANAGEMENT PROGRAMS,
Lindley and Sons, Inc., Hinsdale, Ill.
For primary bibliographic entry see Field 4A.
W76-09751

URBAN STORMWATER MANAGEMENT--PROBLEMS, SOLUTIONS AND IMPACT: A SUMMARY OF INTERVIEWS,
Poertner (Herbert G.), Bolingbrook, Ill.
For primary bibliographic entry see Field 4C.
W76-09752

THE CONTRIBUTION OF A WATER INFORMATION SYSTEM FOR ENVIRONMENTAL PLANNING IN MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Geography.
For primary bibliographic entry see Field 6G.
W76-09753

IMPROVING WATER QUALITY BY CONTROL OF ALGAE: CELLULAR AND EXTRACELLULAR BLUE-GREEN ALGAL POLYSACCHARIDES,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
R. B. Wildman, W. C. Wildman, G. E. Rottinghaus, and B. L. Benner.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-254 614, $6.00 in paper copy, $2.25 in microfiche. Completion Report, Iowa State Water Resources Research Institute Ames, Completion Report, No. ISWRRI-74, December 1975. 119 p, 32 fig., 15 tab., 160 ref. OWRT B-039-IA(2), B-043-IA(1), 14-31-0001-3888/4084.

Descriptors: *Cyanophyta, *Nuisance algae, Algae, Plankton, Aquatic microorganisms, Aquatic algae, Aeration, Water quality, *Eutrophication, Lakes, *Iowa, Water pollution effects, *Pollutant identification, Anabaena, Nostoc, Hydrolysis, Gas chromatography, *Algal control.
Identifiers: *Extracellular products, *Polysaccharides, Aphanizomenon flos-aquae, Anacystic nidulans.

Lakes in Iowa were surveyed for blue-green algal blooms each summer from 1972 through 1975. Physicochemical and biological parameters of four lakes were measured each year during and following blue-green algal blooms of a single dominant species or two co-dominants in one case. One lake was studied for six months during periods of aeration and non-aeration. The ultrastructure of the life cycle of Aphanizomenon flos-aquae was followed in nature and in culture. The influence of strains of Anabaena cylindrica, Anacystic nidulans, and Nostoc muscorum on the pH and buffer capacity of culture media was observed. During periods of dense algal blooms, lake water was collected and processed for isolation of water-soluble organic material which was found to be polysaccharide. The corresponding bloom algae were processed to yield whole cell, wall, intracellular, and sheath (in two cases) polysaccharide fractions. The chemical composition of polysaccharides from lake water and algal fractions was determined by hydrolysis and identifica-

tion of component monosaccharides, using paper, thin-layer, and gas-liquid chromatography. Molar ratios of the component monosaccharides were determined. Polysaccharides of blue-green algae grown in culture were analyzed in the same manner. Studies were initiated on the relationship between blue-green algal bloom species and aquatic bacteria associated with them, particularly concerning the role of algal polysaccharides.
W76-09760

FINANCING POLLUTION ABATEMENT EQUIPMENT FOR TEXTILES AND OTHER SOUTH CAROLINA INDUSTRIES.
Clemson Univ., S.C. Dept. of Economics.
March 26, 1974. 107 p.

Descriptors: *Pollution abatement, *Financing, *Industries, *Bond issues, *South Carolina, Interest rates, Cost repayment, Taxes, Marketing, Legal aspects, Federal government, State governments, Legislation, Methodology.

The contributions to this seminar discuss various aspects of financing industrial pollution abatement facilities, with emphasis on interest rates and costs of pollution control bonds and industrial revenue bonds. A comprehensive discussion of the PCB as a financing instrument, the restrictions imposed upon it both by the investment community and by the IRS, and the versatility of PCB financing is presented. Several alternative state legislative options to finance industrial pollution control, with emphasis on South Carolina, are also presented. Contributions cover the methodology of PCB financing, the role of the underwriter in tax exempt financing for industrial expansion and pollution control, one company's experience with a political subdivision in South Carolina; and the use of tax exempt industrial revenue bonds to finance pollution control projects. All combine to present a detailed picture of the most advantageous financing method for pollution control by industries and municipalities. (See W76-09767 thru W76-09771) (Auen-Wisconsin)
W76-09766

PRESENTATION CONCERNING POLLUTION CONTROL FACILITIES REVENUE BONDS,
Sinkler, Gibbs, Simon and Guerard, Charleston, S.C.
T. B. Guerard.
In: 'Financing Pollution Abatement Equipment for Textiles and Other South Carolina Industries, March 26, 1974, Shrine Hall, Office of Professional Development, Clemson Univ., South Carolina, 15 p.

Descriptors: *Pollution abatement, *Financing, *Industries, South Carolina, Equipment, Facilities, Bond issues, Interest rates, Legislation, Textiles, Cost repayment.
Identifiers: Tax exemption.

South Carolina's approach to financing industrial pollution abatement facilities is encompassed by the Industrial Revenue Bond Act passed in 1967 and by the Pollution Control Facilities Revenue Bond Act of 1971, since the former did not clearly provide for financing for only air or water pollution control facilities. While the 1967 Act can finance pollution abatement facilities as part of a manufacturing plant being financed by bonds, there is no clear authorization to finance pollution abatement facilities independent of financing of the plant. The 1971 Act provides that pollution control facilities may include those designed both for the elimination or abatement of pollution and may be constructed as part of, and may include facilities also designed for, the recovery of chemicals or to serve some other commercially beneficial purpose, but which also contribute to pollution abatement. The primary purpose of financing under both of these acts is to obtain tax-free treatment of interest, and, as a result, reduced interest cost to the industry. The applicability of the Internal Revenue Code to tax exemptions for this type of financing is discussed, particularly if recovery processes are introduced with pollution abatement facilities. (See also W76-09766) (Auen-Wisconsin)
W76-09767

ROLE OF THE UNDERWRITER IN TAX EXEMPT FINANCING FOR INDUSTRIAL EXPANSION AND POLLUTION CONTROL,
Interstate Securities Corp., Charlotte, S.C.
C. B. Watson.
In: 'Financing Pollution Abatement Equipment for Textiles and Other South Carolina Industries,' March 26, 1974, Shrine Hall, Office of Professional Development, Clemson Univ., South Carolina. 7 p.

Descriptors: *Pollution abatement, *Financing, *Industries, *Bond issues, South Carolina, Taxes, Interest rates, Marketing.
Identifiers: Tax exemption, Underwriters.

The chief function of the underwriter is that of designing the financial package so that it not only meets the specific needs of his client, the corporation, but that it is also a marketable security. Revenue bond purchasers are generally fire and casualty insurance companies, banking institutions, bond funds, and high tax bracket individuals. In 1973 South Carolina issued $43.6 million in pollution control bonds, with interest rates ranging from 5.318% to 6.386%. The factors affecting interest rates are the financial strength of the lessee; the marketability of the bonds; the rating applied to the bonds; the sizes of the issuing company and issue; the company's industry segment; current market conditions; and the underwriter's expertise of how and to whom to market the issue. The underwriter often suggests that the corporation obtain a credit rating on its industrial revenue or pollution control issue, as rated bonds can lead to lower interest rates and generally have greater marketability than non-rated bonds. The investment banker's job also includes the presentation of various alternatives to the corporate executive and advice in the decision making to provide the lowest available interest cost and simultaneously obtain optimum profitability. (See also W76-09766) (Auen-Wisconsin)
W76-09768

THE INDUSTRIAL REVENUE BOND FOR POLLUTION CONTROL: ONE COMPANY'S PERSPECTIVE,
La France Industries, S.C.
J. E. Haller.
In: 'Financing Pollution Abatement Equipment for Textiles and Other South Carolina Industries,' March 26, 1974, Shrine Hall, Office of Professional Development, Clemson Univ., South Carolina. 10 p.

Descriptors: *Pollution abatement, *Financing, *Bond issues, *Industries, Facilities, Textiles, South Carolina, Interest rates, Taxes, Local governments.
Identifiers: Industrial revenue bonds, Tax exemption.

The procedure involved in financing pollution abatement facilities by industrial revenue bonds at the Riegel Textile Corporation, operating in two counties of South Carolina, is described. The bonds are issued by the respective county and are secured by the facility acquired with the proceeds from the bonds. Interest on the bonds and redemption are dependent upon the revenue coming from the user of the facility. The federal and state codes provide that if all of the proceeds of the bond issue are used to provide water or air pollution control facilities, interest paid on the obligation are free of income taxes consequently reducing the interest rate on the bonds. The money is deposited in a construction fund account and is disbursed upon presentation of bills which Riegel certified were for the construction of the facilities. The county executes a Pollution Control Facilities Revenue Note which provides a repayment schedule and also provides that it is a limited obligation of the county and is payable solely out of monies derived by the county from Riegel and does not constitute a pecuniary liability of the county. (See also W76-09766) (Auen-Wisconsin)
W76-09769

FINANCING POLLUTION CONTROL PROJECTS IN SOUTH CAROLINA USING TAX-EXEMPT INDUSTRIAL REVENUE BONDS,
Spring Mills, Grace, S.C.
W. A. Moore.
In: 'Financing Pollution Abatement Equipment for Textiles and Other South Carolina Industries,' March 26, 1974, Shrine Hall, Office of Professional Development, Clemson Univ., South Carolina. 7 p.

Descriptors: *Pollution abatement, *Financing, *Industries, *Bond issues, Methodology, South Carolina, Taxes, Amortization, Interest rates, Costs.
Identifiers: Tax exemption.

The vehicle chosen by the Springs Mills, Inc., to finance the pollution abatement facilities at their Grace Finishing Plant in South Carolina was tax-exempt industrial revenue bonds issued by a political subdivision (Lancaster County) but unconditionally guaranteed by the firm. The agent was an investment banking firm who proposed a 20-year serial bond issue at an attractive interest rate. Involved in the process were the company whose credit secures the bonds; the county issuing the bonds; and independent bond counsel who verified the tax-exempt status of the bonds; and the underwriters who distribute them. An interim loan agreement was entered into with the county as this form of agreement allowed the firm to retain ownership of the facilities at all times. The State Board of Health and Environmental Control must also approve the project (after rating the bonds) because of the pollution control aspects; the approval is followed by a 20-day public notice. The trust indenture was finalized following approval of the prospectus. This indenture provides terms for disbursing and receiving funds involved in the issue. The bonds were then sold and the funds were turned over to the trustee for disbursement to the issuing authority who will receive repayments of principal and interest from the company. (See also W76-09766) (Auen-Wisconsin)
W76-09770

THE POLLUTION CONTROL BOND,
Clemson Univ., S. C. Dept. of Economics.
J. J. Glocker.
In: 'Financing Pollution Abatement Equipment for Textiles and Other South Carolina Industries,' March 26, 1974, Shrine Hall, Office of Professional Development, Clemson Univ., South Carolina. 59 p. 6 tab.

Descriptors: *Pollution abatement, *Bond issues, *Financing, Industries, Legal aspects, Marketing, Taxes, Interest rates.
Identifiers: *Pollution control bonds, Tax exemption.

The comparatively recent entrance of the pollution control bond (PCB) as an industrial debt instrument to finance pollution abatement facilities, its history, its flexibility, the discord it has caused in the investment community, its marketing problems, and the IRS restrictions on its tax exempt status, are discussed. For the larger company, with established credit rating and a massive cleanup job, the PCB is the cheapest money around. The widely offered incentives of state property exemptions can also generate substantial savings. The advantages of a regional treatment facility, as exemplified by the Gulf Coast Waste Disposal Authority, servicing 140 plants on the Houston Ship Channel, are that they can shift pol-

lution control responsibility to a public agency resulting in immunity from prosecution; companies can also enjoy a 10 to 25% cost saving accruing from economies of scale as well as tax exempt financing and exclusion from property taxes on the facility. The Ohio Water Development Authority is cited as an example of comprehensive and well designed legislation to provide help to both industrial and local governmental agency programs. Among other aspects of PCB financing discussed, is the dichotomy between the IRS point of view of the PCB tax status regarding recycling or reclaiming byproducts and EPA's conservation objective. (See also W76-09766) (Auen-Wisconsin).
W76-09771

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: GRAIN PROCESSING SEGMENT OF THE GRAIN MILLS INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
S. G. Unger, and M. W. Wjolverton.
Available from the National Technical Information Service as PB-240 196, $7.50 in paper copy, $2.25 in microfiche. Report EPA-230/2-74-014, February 1975. 186 p. 6 fig., 63 tab., 27 ref. 68-01-1533.

Descriptors: *Economic impact, *Water pollution control, *Food processing industry, Corn(Field), Rice, Wheat, Prices, Costs, Employment, Waste water treatment, Standards, Effluents, Industrial production, Employment, Regional economics, Financing.
Identifiers: *Grain milling industry, Flour milling, Rice milling, Corn milling.

The structures of the corn wet milling, corn dry milling, bulgar processing, and parboiled rice milling segments of the grain milling industry are analyzed with respect to the impact of the 'best practicable technology,' 'best available technology' and 'new source performance standards' of pollution abatement on financing, production, employment, community impact, and foreign trade. Since most of the plants discharge into municipal systems whose treatment processes are adequate to control pollution, these segments of the industry are not likely to experience severe economic impacts through imposition of treatment standards; many effects would be minimal and would be important only on an individual plant basis. Very few corn wet milling plants discharge directly to surface water. Individual plant waste technology is such that no plant need close because of pollution controls. The only difficulty that pollution control will impose on these industry segments may be one affecting growth as municipal treatment systems may prove inadequate to receive large quantitative increases in wastewater. Corn dry milling plants will also be only marginally affected by pollution control costs. Their present profitability, financial conditions, and production technologies are sufficient to absorb those costs which cannot be passed through to purchasers. All existing bulgur and parboiled rice plants discharge into municipal systems. (Auen-Wisconsin)
W76-09775

WATER USE POLICIES AND POWER PLANT ECONOMICS,
Houston Univ., Tex.
K. Inoue, E. J. Henley, G. H. Otto, and R. G. Thompson.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-239 822, $5.50 in paper copy, $2.25 in microfiche. Report No. NSF-RA-B-74-014, June 1974. 122 p. 39 fig., 5 tab., 32 ref., 7 append. NSF (RANN) GI34459.

Descriptors: *Water policy, *Electric power costs, *Cooling towers, *Water utilization, Cooling water, Electric power production, Optimization, Taxes, Operating costs, Water treatment.

How a water withdrawal tax of from 0 to 2 cents/1000 gal; a heat discharge tax of from 0 to 20 cents/10 million BTU; a temperature differential constraint between cooling water discharge temperature and reservoir temperatures of 5 to 20 deg F; and various heat discharge constraints relate to water use and water quality and to the cost of generating electric power and the demand for cooling water, are compared. The effects of these policies and/or combinations (totaling six) on the price of power are computed for a 500,000 KW prototype plant operating at 2000 boiler pressure and 1050 deg F on a once-through cooling system, a closed cycle wet tower cooling system, an open cycle wet tower cooling, and a dry cooling tower system. Each policy variable was changed and the power cycles and cooling systems were reoptimized to find the cooling system and operating conditions which produce the lowest cost power. The stack gas scrubber and the water treatment plant are not explicitly included in the cost and operation equations developed. The computations were based on a parametric search of 19-key designs. (Auen-Wisconsin).
W76-09776

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: FERTILIZER INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
M. L. David, J. M. Malk, and C. C. Jones.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-241 315, $7.75 in paper copy, $2.25 in microfiche. Report No. EPA-230/2-74-010, January 1974. 221 p. 9 fig., 74 tab., 2 append. 68-01-1533

Descriptors: *Water pollution control, *Economic impact, *Industries, *Fertilizers, Effluents, Standards, Pricing, Employment, Regional economics, Industrial production, Financing, Return(Monetary), Costs, Foreign trade, Analysis.
Identifiers: Nitrogenous fertilizers, Phosphate fertilizers, Financial analysis.

Based on 1972 conditions and model plant data, the effects of 'best practicable technology' (BPT), 'best available technology' (BAT), and 'new source performance standards' (NSPS) of pollution control are evaluated. It is concluded that the larger companies of the nitrogenous and phosphatic fertilizer segments of the industry will be able to finance new investment in pollution control facilities; smaller companies may find new investment difficult or impossible. Small ammonium nitrate plants may be impacted severely, with over half of the plants and about one-third of capacity possibly shut down. Small diammonium phosphate (DAP) plants may also suffer severly, with just over one-quarter of the capacity affected. Other segments of the fertilizer industry are expected to be impacted much less severely. NSPS may cause some delay in the construction of medium-sized DAP and triple superphosphate plants, but expected higher prices would probably make such plants profitable. NSPS will probably not be a deterrent in the other segments. Total estimated employment losses due to pollution control range from 490 to 1620 jobs with payrolls of $5.9 to $19.4 million, but closures are not expected to impact any one area of the country. Price increases due to pollution abatement would be relatively small in relation to normal swings in export prices with negligible effect on the balance of payments. (Auen-Wisconsin).
W76-09777

SECONDARY EFFECTS OF PUBLIC INVESTMENTS IN HIGHWAYS AND SEWERS.
Environmental Impact Center, Inc., Newton, Mass.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-240 332, $6.00 in paper copy, $2.25 in microfiche. Report EOC 3172deffl, February 1975. 148 p. 18 fig., 26 tab., 19 ref. EQC 317

Descriptors: *Government finance, *Highway effects, *Sewerage, *Land use, Urbanization, Econometrics, Model studies, Regional economics, Zoning, Regression analysis, Regional development, Third party effects, Computer programs.
Identifiers: Case studies, Washington(DC), Boston(Mass), Denver(Colo), Minneapolis-ST. Paul(Minn).

Econometric techniques for forecasting secondary effects of highway and sewer construction on land use patterns of metropolitan regions are described. Data were collected on the amount and location of single and multi-family unit construction, together with commercial and industrial land development at Washington, D.C., Boston, Denver, and Minneapolis-St. Paul and related by regression analysis to sewer service availability, proximity to major highways, amount of vacant land, residential vacancy rate, and land market conditions. The statistical analysis was tested by a dynamic model applied to Washington, D.C. The relative importance of each factor varied substantially between regions. Although several types of development were affected, the greatest influence of sewer investment appeared to be on the single-family housing construction in all areas studied. A greater influence of sewers is anticipated with stricter water pollution control. The effect of new highways on various types of development was marginally dependent on preexisting highways. The study shows that quantitative techniques can be developed for specific regions, which would allow project planners to estimate the magnitude and type of likely secondary effects associated with proposed infrastructure investments. The suggested approach is to develop a set of equations reflecting the particular conditions and circumstances applicable to the specific region. (Auen-Wisconsin).
W76-09778

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: APPLE, CITRUS AND POTATO PROCESSING SEGMENTS OF THE CANNED AND PRESERVED FRUITS AND VEGETABLE INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
D. J. Wissman, D. L. Jordening, and S. G. Unger.
Available from the National Technical Information Service, as PB-240 195, $8.00 in paper copy, $2.25 in microfiche. Report EPA-230/2-74-012, February 1975. 224 p. 93 tab. EPA 65-01-1533.

Descriptors: *Economic impact, *Food processing industry, *Water pollution control, *Pollution abatement, Apples, Citrus fruits, Potatoes, Effluents, Standards, Capital costs, Waste water treatment, Operating costs, Employment, Financing, Pricing, Return(Monetary), Regional economics, Asparagus, Foreign trade.
Identifiers: Fruit processing, Vegetable processing.

The canning and freezing segments of the industry consist of 36% small, 29% large, and 10% very large firms, with the large, multiproduct plants increasing their percentage of production. In general, industry concentration--when measured by value of shipments--is greater for the canned and dehydration segments than for the frozen fruit and vegetable segments; between 1963-1970 the larger frozen food firms have increased their share of output. Overall employment is trending downward in the canning segment but almost doubling in the freezing segment. Smaller and some of the medium-size plants may not be able to survive the added costs of pollution abatement. A synthesized analysis of cost and return data projects economic data for a 20-year period, showing estimated pollution abatement costs, with and without internal waste treatment. There is apparently available capital to finance pollution control for large and medium-sized canners, and especially freezers. However, individual plants and

local considerations may have unique overriding conditions that prelude financing. If the industry successfully passes pollution abatement costs to consumers, the price increases would have little impact on consumption patterns. The impact of the imposition of effluent standards on the citrus and apple segments are detailed under price, financial, production, employment, community, and other effects. (Auen-Wisconsin).
W76-09779

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: INSULATION FIBERGLASS INDUSTRY.
Environmental Protection Agency, Washington, D.C. Office of Planning and Evaluation.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-240 649, $4.50 in paper copy, $2.25 in microfiche. Report EPA-230/2-74-011, January 1975. 49 p. 5 fig., 8 tab.

Descriptors: *Water pollution control, *Economic impact, *Thermal insulation, *Industries, Effluents, Standards, Waste water treatment, Costs, Prices, Employment, Foreign trade, Regional economics , Financing, Return(Monetary), Industrial production.
Identifiers: *Wool fiberglass industry.

The cost of water pollution control (zero discharge-water recycle) in wool fiber glass plants varies from 0.18 to 1.15 cents/lb of glass wool produced and is sensitive to plant capacity. The incremental capital investment cost is 1.3 to 3.8% of current plant investment and any increase due to pollution abatement will be modest and not likely to increase prices. However, if operating costs increase concurrently, the cumulative total might become significant. With no price increases, those plants with current return on investment of 10-15% or greater will continue to enjoy good returns. Investment cost for water pollution control-recycle is 1.25 - 3.75% of current plant investment which will be expended over three years. The annual expenditures for water treatment and recycle are modest and will not have any significant impact on normal capital expenditures of major companies. The supply/demand projections indicate that pollution abatement expenditures will not affect production. No plant shutdown is likely to occur; rather one major producer plans to increase capacities in spite of additional abatement cost. Glass wool exports represent about 2% of production and pollution abatement costs will not influence import/export markets. No effects on unemployment in the industry or secondary effects on communities are anticipated. (Auen-Wisconsin).
W76-09780

METAGAME THEORY AND ITS APPLICATIONS TO WATER RESOURCES,
Waterloo University (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W76-09847

METHOD AND COMPOSITION FOR PREVENTING WATER CONTAMINATED WITH INDUSTRIAL WASTE FROM SEEPING THROUGH SOIL CONTAINING SAID WATER,
American Colloid Co., Skokie, Ill. (Assignee).
A. G. Clem.
U.S. Patent No. 3,949,560, 4 p, 7 ref; Official Gazette of the United States Patent Office, Vol 945, No 2, p 599, April 13, 1976.

Descriptors: *Patents, *Industrial wastes, *Seepage control, *Settling basins, *Confined water, *Water pollution treatment, *Water quality control, *Water pollution control, Bentonite, Impervious soils, Chlorides, Sulfides, Sulfates, Polymers, Soil dispersants.

A method is provided for forming lagoons and other water-holding areas which will not allow seepage of water containing inorganic water-soluble industrial waste compounds. A mixture of soil and a soil sealant composition composed of bentonite, a water-soluble dispersing agent, and a water-soluble polymer are used to form a water containing enclosure. The bentonite is prevented from disintegrating when contacted with water containing water-soluble industrial waste compounds such as inorganic water-soluble chloride salts, sulfate salts and sulfite salts by the use of the water-soluble dispersent and a water-soluble polymer. The water-soluble dispersent can be a water-soluble salt of phosphoric acid such as hypophosphate, orthophosphate, metaphosphate, and pyrophosphate. The preferred water-soluble polymer is polyacrylic acid. (Sinha-OEIS)
W76-09858

COMBINATION PROVIDING SAFETY BERTHING, UNLOADING OF OIL, AND CONDUIT CARRIAGE TO REFINERIES ON LAND, OF LARGE DEEP-SEA-REQUIRING TANKERS,
Parson, Brinkerhoff, Quade and Douglas, Inc., New York. (Assignee).
C. J. Murphy.
U.S. Patent No. 3,950,805, 4 p, 19 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1024, April 20, 1976.

Descriptors: *Patents, Engineering structures, *Environmental effects, *Water pollution control, *Oil industry, Abatement, Pollution abatement, Water quality control, Conduits, Pontoons, Continental shelf.
Identifiers: *Outer Continental shelf, Tankers, Oil tankers, Mooring, Offshore technology.

A subaqueous conduit extends from a mainland terminal and leads to the base of a tubular mooring stanchion which extends above the sea surface. The base of the stanchion is located at a depth of up to 100 fathoms adapting the stanchion for the mooring of very large oil tankers. Secured to the stanchion is a double floating pontoon structure to which tankers can berth. The tankers are moored alongside the pontoon structure and discharge their oil through swivel-jointed tubes at the upper portion of the stanchion which permit relative motion of the tanker caused by sea conditions. The pontoon structure can be ballasted to submerge to a predetermined depth during adverse weather conditions. The stanchion may receive oil from two tankers simultaneously and is adapted for connection to a plurality of submarine conduits by which oil from the stanchion may be received at a number of land-based reception points. (Sinha - OEIS)
W76-09865

APPARATUS AND METHOD FOR RECOVERING PURE WATER FROM NATURAL SOURCES AND INDUSTRIAL POLLUTED WASTE SOURCES,
S. L. Ross, and O. Shuffman.
U.S. Patent No. 3,951,198, 5 p, 5 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 945, No 3, p 1153, April 20, 1976.

Descriptors: *Patents, *Industrial wastes, *Gases, *Air pollution, *Reclaimed water, Water sources, *Condensation, Generators, Potable water, Condensers.
Identifiers: Thermal energy generators.

A method and apparatus is described for purifying industrial waste gases in order to avoid polluting the atmosphere and to produce comparatively pure water. The waste gases are first cooled and then passed to a waste gas purifier unit from which the waste gases are circulated between the outer wall of the waste gas purifier and a surrounding insulated duct prior to exhausting to the atmosphere, with the liquid waste from the waste gas purifier being conducted to a liquid collection means and then to a thermal energy generator for the production of super-heated steam that is subsequently condensed to produce comparatively pure water. The apparatus includes an in-line condenser for reducing the temperature of the industrial waste gases prior to being conducted to the waste gas purifier. The solid particulate matter of the industrial waste gases are collected in suitable disposal containers. (Sinha - OEIS)
W76-09867

RESULTS OF HYGIENIC AND TOXICOLOGICAL STUDIES OF PESTICIDES IN COUNTRIES OF THE COUNCIL OF MUTUAL ECONOMIC ASSISTANCE IN 1962-1972, (IN RUSSIAN),
Ustav Hygieny, Bratislava (Czechoslovakia).
L. Rosival, A. Sokolai, and V. Batora.
Gig Sanit. 5, p 73-76, 1974.

Descriptors: Pesticides, *Pesticide residues, Toxicity, Europe, *Water quality standards, Air pollution, Soils, Public health, Environment.
Identifiers: Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, USSR.

Data are presented on the coordination of investigations of member countries of the Council of Mutual Economic Assistance (Czechoslovakia, East Germany, Poland, Hungary, USSR, Bulgaria) on the topic 'Hygienic and toxicological study of pesticide residues in the environment.' The general tasks of investigations on this topic are formulated: to reduce the danger of pesticide residues in the external environment (food products, forage, water, soil, air) for the health of the population; to set rates for pesticides in the environment based on a study of their toxicological properties, dynamics of residues, etc.; to establish allowances and develop and standardize analytical methods of determining pesticides in man's environment.--Copyright 1975, Biological Abstracts, Inc.
W76-09884

HYGIENIC STANDARDIZATION OF FLOTATION REAGENT BB-2 AND ITS COMPONENTS AS INDUSTRIAL CONTAMINANTS OF WATER BODIES, (IN RUSSIAN),
Kazanskii Gosudarstvennyi Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 5B.
W76-09886

ASSESSING POTENTIAL OCEAN POLLUTANTS,
National Academy of Sciences, Washington, D. C.
A Report of the Study Panel on Assessing Potential Ocean Pollutants to the Ocean Affairs Board Commission on Natural Resources, National Research Council, 1975. 438 p, numerous tab and ref.

Descriptors: *Water pollution, Resources development, Pollutant identification, *Environmental effects, *Waste disposal, *Nuclear wastes, Continental Shelf, Toxicity, Industrial wastes, Iron, Copper, Metals, Organic compounds.
Identifiers: *Outer Continental Shelf, *Ocean dumping, Medical wastes, Environmental impact, Tetracyclines, Technetium, Chlorinated hydrocarbons, Aromatic hydrocarbons, Metallic wastes.

The purpose of this study was to develop and test a method for reviewing technologies with a potential impact on marine systems, and to determine whether they clearly pose a potential hazard, whether they are clearly unimportant, or whether they fall into an intermediate category and need further study. Six groups of materials were selected for study: transuranic elements; synthetic organic chemicals; ocean discharges; metallic wastes; medicinal wastes; and marine litter. The study proved successful and some definite conclusions resulted. Two of the materials studied--

transuranic elements and hexachlorobenzene--were identified as clear potential problems, at least when the present limited production is projected into the future. Others; low molecular weight chlorinated hydrocarbons (LMCH's), acrylonitrile, iron and copper wastes, open ocean litter, tetracycline, and technetium; present no demonstrable hazard to open ocean ecosystems at present or foreseeable levels of release. In the remaining cases (aromatic hydrocarbons, certain dumped chemicals, and inshore litter) it was thought that some local adverse effects were possible, but the area of uncertainty could be narrowed and the information required to determine effects was specified. A general conclusion of this study is that many potential ocean pollution problems can be assessed by a detailed review followed by a limited number of well-planned measurements. (Sinha-OEIS)
W76-09889

THE COANDA EFFECT OIL/WATER SEPARATOR: A DEVELOPMENT STUDY,
Navy Civil Engineering Lab., Port Hueneme, Calif.
D. Pal.
Available from the National Technical Information Service, Springfield, Va., 22161, as AD-A011 806, $4.00 in paper copy,$2.25 in microfice. Technical Note N-1389, May 1975. 38 p, 20 fig, 10 tab, 4 ref, append.

Descriptors: *Separation techniques, *Oily water, *Oil pollution, Waste water treatment, *Methodology, Equipment, Technology, Water resources, Resources development.
Identifiers: *Oil-water separators, Wall attachment, 'Coanda effect', Oil recovery, Fluid dynamics.

A new method of separating free oil from oil/water mixtures is under development at the Civil Engineering Laboratory. This technique utilizes the fluid-dynamic phenomenon, called the 'wall attachment, or Coanda effect'. Such a separator would be considerably smaller than the conventional gross separators of the laminar flow types. Based upon the results of the feasibility study, a detailed investigation was carried out to determine the design parameters of a practical separator suitable for gross separation. The report describes in detail the entire development program of the separator. (Sinha-OEIS)
W76-09890

DEVELOPMENT OF A BATCHWISE IN-SITU REGENERATION TYPE SEPARATOR TO REMOVE OIL FROM OIL-WATER SUSPENSIONS,
Hydronautics, Inc., Laurel, Md.
D. H. Fruman.
Available from the National Technical Information Service, Springfield, Va., 22161, as COM75-10608, $4.50 in paper copy, $2.25 in microfiche. Maritime Administration Final Report No. MA-RD-930-75060, December 1974. 49 p, 23 fig, 7 tab, 4 ref, append.

Descriptors: *Waste water treatment, *Oily water, Water resources, *Recycling, *Water quality control, *Separation techniques, Dispersion, Suspensions, Methodology, Reclaimed water, Environmental effects, Water pollution effects.
Identifiers: *Outer Continental Shelf, *Ballast water, Bilge water, Oil-water suspension.

Design test and evaluation of a 600 gpm oil-water separator for ballast water treatment is documented. The basis of the particular separation concept resides in the use of a very thick, open reticulated, oleophilic foam which is capable of separating the dispersed oil phase from the aqueous continuous phase independently of the oil density and which is amenable to regeneration by simple expression. Separation of the oil phase in the oleophilic foam body occurs as a result of filtration, retention and coalescence processes that are discussed in detail. Extensive scavenging and regeneration laboratory tests demonstrated the technical feasibility of a unit in which both processes, separation and regeneration, were performed on a batch basis. During the second phase the conceptual design of a Batchwise In-Situ Regenerated Separator (BIRS) cell and the construction of a 40 gpm bench scale unit for laboratory testing with simulated ballast water was undertaken. Excellent oil separation results were obtained with this unit under a wide variety of operating conditions and contaminant characteristics. The operation manual is incorporated as an appendix.
W76-09895

ENGINEERING AND ECOLOGICAL EVALUATION OF ARTIFICIAL-ISLAND DESIGN, RINCON ISLAND, PUNTA GORDA, CALIFORNIA,
Blume (John A.) and Associates Research Div., San Francisco, Calif.
For primary bibliographic entry see Field 2L.
W76-09903

RECOMMENDED PROCEDURE FOR DEVELOPING DEEPWATER PORTS DESIGN CRITERIA,
Coast Guard, Washington, D.C. Office of Marine Environment and Systems.
Department of Transportation, Office of Marine Environment and Systems, Deepwater Ports Project, Report, Recommended Procedure for Developing Deepwater Ports Design Criteria, 1975. 11 p.

Descriptors: *Design criteria, *Environmental effects, Resources development, Water resources, *Water pollution sources, *Water quality control, Continental shelf, *Ports, Winds, Waves(Water), Currents(Water), Seiches, Tides, Visibility, Temperature, Ice, Protection.
Identifiers: *Deepwater ports, *Superports, Environmental protection, Environmental impact.

The provisions of these procedures are intended to establish methods for defining the environmental conditions which will affect operations at the site and which must be considered in establishing design criteria for all fixed marine and floating components (except hoses) of a deepwater port. Included also is a list of applicable laws concerning protection of the environment. The design criteria treated in this paper are concerned with waves, wind, currents, seiche, tides, visibility, temperature, and ice. In dealing with design loads attention is given to operating mooring loads, operating hawser loads, operating anchor loads, and storm loads. (Sinha - OEIS)
W76-09907

ENVIRONMENTAL IMPACT STUDY OF OFFSHORE SAND AND GRAVEL MINING,
National Oceanic and Atmospheric Administration, Tiburon, Calif. Marine Minerals Technology Center.
For primary bibliographic entry see Field 6G.
W76-09910

AN ENVIRONMENTAL RESEARCH PROGRAM FOR DRILLING IN THE CANADIAN BEAUFORT SEA,
Gulf Oil Canada Ltd., Calgary (Alberta).
J. Hnatiuk.
Journal of Canadian Petroleum Technology, Vol 15, No 1, p 29-36, January-March, 1976. 5 fig, 2 tab, 4 ref.

Descriptors: Oil industry, Resources development, Water resources, *Environmental effects, *Offshore platforms, *Canada, Wildlife, *Oil spills, Water quality control, Continental Shelf, Exploration, Floating, Drilling, Ice cover, Animal populations, Logistics, Research and development, Baseline studies.
Identifiers: *Outer Continental Shelf, *Beaufort Sea, *Artificial islands, Environmental impact, Mackenzie Delta, Prediction, Scouring.

A multi-million-dollar environmental research program consisting of 33 wildlife, biological, oceanographic, meteorological, sea ice and oil clean-up studies related to the southern Beaufort Sea is described. The studies are designed to provide ecological baselines, a better understanding of the physical environment, knowledge related to the consequences of a possible oil spill and means of oil clean-up in ice-infested waters. Seasonal offshore drilling in the Canadian Beaufort Sea from a floating vessel has been approved in principle and is scheduled to be undertaken during the open-water period of 1976. The results of the studies discussed will be used to set operating constraints to safeguard the environment and minimize any adverse impact. The hostile environment is briefly described and problems arising during one of the worst ice seasons on record are discussed. The scope of the studies, research methods and progress to date in individual studies are outlined and, where possible, results are provided. An important phase of the program is public interface to inform northern natives, government, those with environmental concerns and others about the program and the study results. (Sinha-OEIS)
W76-09912

ACADEMIC DATA-NEEDS FOR ENVIRONMENTAL ASSESSMENTS OF OFFSHORE TECHNOLOGICAL OPERATIONS,
New York Ocean Science Lab., Montauk.
For primary bibliographic entry see Field 6G.
W76-09914

COAST GUARD'S RESPONSE TO SPILLED OIL,
Coast Guard Reserve, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W76-09915

BIOLOGICAL PRODUCTION PROCESSES IN THE URAL RIVER, (IN RUSSIAN),
Gosudarstvennyi Meditsinskii Institut, Orenburg (USSR).
For primary bibliographic entry see Field 5C.
W76-09919

POSSIBILITIES AND LIMITATIONS IN BIOLOGICAL CONTROL OF WEEDS,
Staatliches Museum fuer Naturkunde, Ludwigsburg (West Germany).
For primary bibliographic entry see Field 4A.
W76-09920

RECENT TRENDS IN WEED CONTROL IN FRESHWATER,
Agricultural Research Council, Kidlington (England). Weed Research Organization.
For primary bibliographic entry see Field 4A.
W76-09921

THE ERADICATION OF THE SEAWEED SARGASSUM MUTICUM FROM BRITAIN,
Portsmouth Polytechnic (England). Dept of Biological Sciences.
W. F. Jones, and E. B. Gareth.
Biol Conserv. 6(1), p 57-58, 1974.

Descriptors: *Aquatic weed control, Ecosystems, Intertidal areas, Shallow water, Europe, Floating plants.
Identifiers: Britain, Japan, *Sargassum-Muticum, *Seaweed eradication.

Studies indicated that S. muticum, accidentally introduced from Japan to the intertidal lagoons of

the Isle of Wight and Portsmouth Harbor, can drastically change the ecosystem of shallow coastal waters by reducing species diversity. Free-floating masses of detached Sargassum annoy fishermen, boaters and swimmers. Volunteers were sought to pick the plants by hand at regular intervals until all larvae, sporelings and adult plants are eliminated from the area.--Copyright 1974, Biological Abstracts, Inc.
W76-09989

INSECT GROWTH REGULATORS FOR THE CONTROL OF AQUATIC MIDGES,
California Univ., Riverside. Dept. of Entomology.
M. S. Mulla, R. L. Norland, T. Ikeshoji, and W. L. Kramer.
J Econ Entomol. 67(2), p 165-170, 1974.

Descriptors: *Insect control, *Growth rates, Insect resistance, *Diptera, Regulation, Oxidation lagoons, Inhibition, *Midges, Sewage, Insecticides.
Identifiers: Chironomus-Stigmaterus, Procladius-Sp, Tanypus-Grodhausi, Tanytarsus-Sp.

In laboratory, Altosid (isopropyl 11-methoxy-3,7,11-trimethyldodeca-2,4-dienoate) was the most effective compound tested against OP(organophosphate)-resistant and susceptible Chironomus species. This material also was effective against larvae of C. stigmaterus Say and Tanypus grodhausi (Sublette) taken from sewage oxidation ponds and treated in the laboratory. Two slow-release encapsulated flowable formulations of Altosid at 0.2 and 0.1 ppm concentration showed excellent activity against midges of the genera Chironomus, Procladius, and Tanytarsus in small box plots and in field breeding ponds. Both proved superior to the emulsifiable formulations in terms of initial suppression and residual activity. The 2 slow-release and EC (emulsifiable concentrate) formulations were studied in a warm-water lake (5-6 ft deep) where 4-8 acre portions were treated. Slow-release formulations produced good to excellent inhibition of emergence of adults for a period of 1-2 wk. The 10% slow-release greater initial and short-term inhibition of emergence at 0.25 lb/acre AI(active ingredient) than 0.1 lb/acre. EC-formulation yielded lower initial and short-term inhibition of emergence than the 10% slow-release forulation.--Copyright 1974, Biological Abstracts, Inc.
W76-09997

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

ENERGY MODELING AND FORECASTING.
California Univ., Berkeley. Lawrence Berkeley Lab.
Proceedings of the Conference on Energy Modeling and Forecasting, June 28, 29, 1974, Lawrence Berkeley Laboratory, University of California, Berkeley, California. 170 p, 20 fig, 28 tab, 160 ref, 2 append. Benenson, P., Ruderman, H., Merrill, D., and Sathaye, J. (Eds.).

Descriptors: *Energy, *Forecasting, *Methodology, *Model studies, Demand, *Economics, Oil, Environment, Fuels, Supply, Systems analysis, Technology, Simulation analysis, Decision making, Optimization, Water resources, Reservoirs.
Identifiers: Econometrics.

Presented are the proceedings of a conference on methodology in energy modeling and forecasting. The objectives of the conference, held at the Lawrence Berkeley Laboratory, were to evaluate the suitability of present modeling techniques for responding to energy policy questions and to explore approaches for improving each method. Each of the participants in the small but diverse group presented a paper and then a discussion followed, focusing on the strengths and weaknesses of alternative methodologies. The participants were also asked to criticize their methods in terms of the assumptions of the model, the applicability of the model to today's conditions, the policy questions that can most easily be addressed, the time horizon of the model, the treatment of uncertainty, and the phenomena that can be most and least readily described. The first paper deals with the relationship of methods to policy questions. Most of the remaining papers deal with particular methods, including probability theory, network analysis, linear programming, regression analysis, input-output, process analysis, systems dynamics, interactive game theory, and computer simulation techniques. The final presentations, which focus on energy models from a user's point of view, were made by representatives from an oil company and from a public utilities company. (See W76-09603 thru W76-09613) (Bell-Cornell)
W76-09602

ENERGY PROJECTIONS--RELATIONSHIP TO POLICY ISSUES,
Brookhaven National Lab. Upton, N.Y. Energy Systems Analysis Group.
K. C. Hoffman.
In: Proceedings of the Conference on Energy Modeling and Forecasting, Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 1-11. 3 ref, 2 fig, 1 tab.

Descriptors: *Energy, *Forecasting, *Projections, Demand, Research and development, Planning, Regulation, Rates, Environment, Standards, Risks.
Identifiers: *Policy issues, Capital investment, Oil allocation.

Accuracy is not the only criterion for evaluating an energy projection. Other attributes of specific forecasts, such as scope, level of aggregation and time horizon should also be considered in light of the policy issue to be addressed. Even a rough approximation of the relative changes attributable to alternative policy actions may be more important than the accurate determination of the demand level. It is not inconsistent for the same groups to use low or high forecasts, depending upon the policy questions they are trying to answer. Because energy policy questions are related to social, economic, political and environmental issues, energy models must be embedded in an overall framework or model that encompasses these issues. One must understand if these differences reflect different economic and social assumptions, different judgements of the influence of the same assumptions, or different degrees of conservatism imposed by the policy issues addressed. This article distinguishes the factors influencing projections in the near, intermediate, and long-term. Four general policy questions have been examined to indicate which attributes are most important. The four policy questions are: research and development planning, capital investment, near-term allocation of oil, and the regulation of rates and environmental standards. A discussion following the article contains such issues as the possibility of combining economic and technical analyses, the level of detail with which one ought to be modeling, and the problem of the self-fullfilling forecast. (See also W76-09602) (Bell-Cornell)
W76-09603

A PROBABILISTIC MODEL OF THE OIL AND GAS DISCOVERY PROCESS,
Alfred P. Sloan School of Management, Cambridge, Cambridge Mass.
G. M. Kaufman, Y. Balcer, and D. Kruyt.
In Proceedings of the Conference on Energy Modeling and Forecasting, Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 13-26. 7 fig.

Descriptors: *Oil, *Probability, *Model studies, *Reservoirs, *Size, Statistical methods, Sampling, Simulation analysis, Monte Carlo methods, Distribution, Rivers, Computers, Graphical methods, Drilling, Economics.
Identifiers: Petroleum gas, Probabilistic models.

Presented is a probabilistic model for the discovery of petroleum deposits. Two assumptions are made regarding the distribution of reservoir sizes and its relationship to the discovery process for reservoirs within a region of uniform geological characteristics, called a 'play': (1) the size distribution within a subpopulation is log-normal; and (2) the probability of discovering a reservoir is proportional to its size. Presented is a statistical analysis of data from plays in Alberta, Canada to support the assumption that the underlying distribution is log-normal. Estimated is the expected sampling distribution of reservoir size in chronological order of discovery. Since the largest reservoirs are most likely to be discovered first, the sampling distribution deviates from a log-normal distribution, which leads to an overestimate of the amount of petroleum remaining in place. A Monte-Carlo computer simulation of the discovery process is described. Results show the effect of sample size on the shape of the distribution. Further refinement of the model will be made, and further work will be done to incorporate this physical model into an economic model to investigate the optimum investment strategy for the development of a play over time. Subjects in a discussion following the article include: four methods for estimating the total number of reservoirs in a play; application of the model for predicting cumulative discoveries over time; and a method to incorporate model results into an econometric model for estimating a production function for oil or gas. (See also W76-09602) (Bell-Cornell)
W76-09604

COUPLED ENERGY SYSTEM-ECONOMIC MODELS,
Brookhaven National Lab., Upton, N.Y. Energy Systems Analysis Group.
K. C. Hoffman, P. F. Palmedo, W. Marcuse, and M. D. Goldberg.
In: Proceedings of the conference on Energy Modeling and Forecasting, Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 27-40. 3 fig, 3 tab, 6 ref.

Descriptors: *Energy, *Economics, *Model studies, Systems analysis, Technology, Demand, Supply, Assessment, Fuels, Optimization, Linear programming, Input-output analysis, Environment, Costs, Economic efficiency.
Identifiers: Economic models.

A coupled energy system/economic model is being developed for energy policy analysis and technology assessment. The model emphasizes technological detail of both supply and utilizing devices employed in the energy system, in terms of conversion efficiency, cost, and emissions to the environment. The model consists of the Reference Energy System format and the Brookhaven Energy System Optimization Model. Special features of the model that are important for projecting energy supply and demand are the scope of the model in allowing for interfuel substitution, the incorporation of a load-duration curve for the electrical sector, and the inclusion of the utilizing device as an important element in interfuel substitution. The presentation has dealt in detail with the methods for developing the requisite inputs mentioned above, and for operating the model. The model yields the optimal energy flows within the energy demand and resource-supply constraints that are applied for a particular analysis. Also determined is the total annual cost of service and an inventory of emissions to the environment associated with a given energy flow solution. Finally, a study is provided of the range of cost and efficiency over

which given technologies are competitive. A coupling of the optimization overcomes some of the difficulties in the conventional input-output approach by providing for technological change and interfuel substitution in the energy sector. A discussion following this article considers adapting the model to permit the input-output coefficients to change when prices change. (See also W76-09602) (Bell-Cornell)
W76-09605

ENERGY POLICY AND ECONOMIC GROWTH,
Data Resources, Inc., Cambridge, Mass.
E. A. Hudson, and D. W. Jorgenson.
In: Proceedings of the Conference on Energy Modeling and Forecasting, Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 41-76. 19 tab, 41 ref.

Descriptors: *Energy, *Economics, *Model studies, Industries, Input-output analysis, Prices, Demand, Estimating, Fuels, Methodology, Evaluation, Taxes, Effects, Equations, Systems analysis, Investment.
Identifiers: Producer behavior, Energy projections, Energy policy, Interindustry model, Interindustry transactions.

Hudson's approach to analyzing energy developments and energy-nonenergy economic relationships involves: (1) an interindustry model of U.S. economy, incorporating nine intermediate sectors, with emphasis on the energy-producing sectors; (2) econometric models of producer behavior for each of the domestic producing sectors; (3) a macroeconomic growth model; and (4) sub-models of personal consumption expenditures and of investment, government and export components of final demand. Prices of domestic availability of output and the input-output coefficients in the production of this output are endogenous functions, simultaneously determined within the producer behavior models. Output prices and production structure reflect producer adjustment to the prevailing set of prices of the products of all sectors and of capital, labor, and competing imports. The macro-econometric growth model consists of endogenous production and household sectors and exogenous foreign and government sectors. The model integrates demand and supply conditions or consumption, investment, capital and labor. Dynamic aspects of capital accumulation and consumer behavior are incorporated. Model applications reported include a set of projections of energy use and its composition, an analysis of structural changes resulting from an energy use tax, and an estimate of the effects of an energy tax policy designed to promote energy independence. (See also W76-09602) (Bell-Cornell)
W76-09606

METHDOLOGICAL ISSUES IN THE ECONOMETRIC ESTIMATION OF ENERGY DEMAND ELASTICITIES,
Wharton School of Finance and Commerce, Philadelphia, Pa. Dept. of Economics.
J. M. Griffin.
In: Proceedings of the Conference on Energy Modeling and Forecasting, Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 77-89. 23 ref.

Descriptors: *Energy, *Demand, *Estimating, *Model studies, *Economics, *Methodology, Prices, Income, Fuels, Economics, Least squares method, Equations, Time series analysis, Systems analysis.
Identifiers: Policy analysis, Fuel shares, Translog approach, Price elasticities.

This paper describes preliminary work on a model to estimate the long-run price, cross-price, and income elasticities of energy sources using econometric analysis on pooled international data. In recognizing the derived demand nature for crude oil and the numerous possibilities for long-run interfuel substitution, Griffin proposes determining the aggregate final demand for energy in each of eight fuel-using sectors. In a second step, the shares of the respective fuels would be determined. The sample consists of observations for 20 OECD countries drawn at 5 year intervals from 1955-70, giving 80 observations. Discussed are two alternative procedures for estimations of fuel shares. The first is use of ordinary least squares. An alternative approach popularized by Christenson, Jorgenson and Lau is the Translog cost function approach. The advantages and drawbacks of each are discussed. The basic issues are whether the restrictive theoretical conditions of the Translog approach are met statistically and how large the loss in goodness-of-fit will be with the Translog model. Model applications are envisioned to be for long-run forecasting and policy analysis. (See also W76-09602) (Bell-Cornell)
W76-09607

ENERGY SYSTEMS: MODELING AND POLICY PLANNING,
Massachusetts Inst. of Tech. Cambridge. Energy Lab.
M. L. Baughman, and E. Hnyilicza.
In: Proceedings of the Conference on Energy Modeling and Forecasting, Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 91-100. 1 tab, 19 ref.

Descriptors: *Energy, *Systems analysis, *Planning, *Model studies, Economics, Methodology, Simulation analysis, Optimization, Fuels, Estimating, Supply, Demand.
Identifiers: *National energy policy, Multidisciplinary, Cost minimization.

This presentation is drawn from two papers. The first is an overview of the major issues pertinent to the formulation of national energy policy, including such issues as the nonrenewability of fossil fuels, imports, national security, and balance of payments. The modeling task and steps are (1) development of conceptual models, (2) identification of data needs, (3) estimation of parameters, (4) assessment of model validity, and (5) testing, prediction, and policy analysis. Alternative ways in which models can be used for policy planning through simulation and optimization techniques are presented. The second paper contains the theoretical framework and results of a descriptive model of energy supply and demand. Demand is broken down into residential, commercial, industrial and transportation sectors. The model is used to establish the consistency of estimates and projections and to maintain a system of accounting. Baughman has used his interfuel substitution study as an example of the model building process described in his modeling and policy planning paper. He gives two examples of how the choice of model depends upon the particular characteristics of a sector and the data availability. The first example is the residential-commercial sector, where fuel choice is a two-step process. The second example is the model for electricity supply, for which he uses engineering estimates. Baughman suggests: (1) linking macro mode models that account for political intervention with micro models that describe fuel supply and demand; and (2) coupling optimization techniques with descriptive models such as the one he has described. (See also W76-09602) (Bell-Cornell)
W76-09608

ENERGY CONSUMPTION AND FUEL CHOICE BY RESIDENTIAL AND COMMERCIAL CONSUMERS IN THE UNITED STATES,
Massachusetts Inst. of Tech., Cambridge. Energy Lab.
M. L. Baughman, and P. L. Joskow.
In: Proceedings of the Conference on Energy Modeling and Forecasting, Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 101-119. 4 tab, 3 fig, 15 ref, 2 append.

Descriptors: *Energy, *Model studies, *Simulation analysis, *Decision making, *Fuels, United States, Estimating, Prices, Economics, Electricity, Natural gas, Oil, Equations, Temperature, Systems analysis.
Identifiers: *Energy consumption, Commercial, Residential.

This paper reports the conceptual design and estimation results of models for total demand and aggregate fuel choice decisions in the residential and commercial sector. Fuel utilization decisions can be separated into a two-level decision process. First, the consumer decides on the level of energy using services he desires to meet his functional needs, then he seeks to find the combination of fuels that will provide these services most cheaply. This dichotomy forms the basis for the models adopted. The model used to explain total demand for energy in the residential and commercial sector is a simple flow adjustment model. The long run price and income elasticities of demand in this sector are estimated to be about -0.50 and 1.0 respectively. The short run elasticities were about 16% of these values. Finally, a set of simulations to 1980 are performed using some hypothesized price scenarios. Results show that much conservation can be expected to take place in the residential and commercial sector as a result of price increases and that the geographic shifts in consumption are highly dependent on both the particular fuel in use and the cost of competing fuels in the region. Both these effects should have important significance for policy decisions in the energy area. The paper concludes with a discussion of the modeling and of the potential role of behavioral sciences in the quantitative analysis of supply and demand. (See also W76-09602) (Bell-Cornell)
W76-09609

JOINT USA/JAPAN PROJECT ON GLOBAL SYSTEMS ANALYSIS AND SIMULATION (GLOSAS) OF ENERGY, RESOURCES, AND ENVIRONMENTAL (ERE) SYSTEMS,
Japan GLOSAS Project Committee, Tokyo.
T. Utsumi, and E. A. Eschbach.
In: Proceedings of the Conference on Energy Modeling and Forecasting, Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 121-144. 4 fig, 36 ref.

Descriptors: *United States, *Projects, *Simulation analysis, *Energy, *Systems analysis, Effects, Resources, Environment, Computers, Methodology, Networks, Decision making, Research, Design, Supply, Demand, Fuels, Technology, Planning.
Identifiers: *Japan.

Described is a joint United States-Japanese project currently under development for Global Systems Analysis and Simulation (GLOSAS) with special emphasis on the problems of energy, resources and environmental systems. The GLOSAS project is intended to provide decision makers in the participating countries with comprehensive solutions within an international framework. Impacts on domestic economies, international trade and the international monetary system are included. When completed, the project will employ an international computer conferencing network via satellite telecommunications for worldwide interactive simulation modeling. Global simulation would be carried out by running submodels of socio-economic systems on computers throughout the world linked by the communications system. Typical submodels would be for crude petroleum production, world petroleum trade, and domestic economic and energy models. Such diverse modeling techniques as systems dynamics, input/output, linear programming and econometrics would be employed where appropriate. The models will permit input of policy makers' decisions via interactive terminals. Thus an interactive gaming situation for alternative scenarios will exist whereby the results of policy decisions or strategies formulated in different

countries could be exhibited. An objective of the project is to improve cooperation for setting worldwide energy policy. (See also W76-09602) (Bell-Cornell)
W76-09610

THE USE OF ECONOMETRICS TO PROJECT ENERGY DEMANDS,
Data Resources, Inc., Lexington, Mass.
P. K. Verleger, Jr.
In: Proceedings of the Conference on Energy Modeling and Forecasting Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 145-157. 17 ref.

Descriptors: *Energy, *Demand, *Mathematical models, Prices, Forecasting, Economics, Fuels, Transportation, Industries, Equations, Systems analysis, *Projections.
Identifiers: *Econometrics, Disaggregation.

Presented is a critique of econometric techniques for projecting energy demands, and the usefulness of these techniques for analyzing policy is discussed. The pairing of modeling techniques with specific problems is necessary if projections made by econometric techniques are to be accurate. During the last five years most of the econometric projections have been at a very aggregated level and price impacts have been systematically excluded. A subset of these studies is mentioned having the following characteristics: (1) a specific sector and fuel is examined; (2) the model is regionally disaggregated; (3) price is included as an explanatory variable; and (4) attention is paid to the theoretical structure of demand. A model with these characteristics may, given proper projections of exogenous data, function as a good forecasting tool. An important difference between the two model types is that the disaggregated model attempts to distinguish between the energy usage pattern and the capital stock of energy-using devices. The stock-flow separation is discussed in detail and a model is sketched that incorporates this distinction. This model allows for extramarket constraints on the choice of fuel, such as the unavailability of fuel in a particular region. Such a model can be used under the situations prevailing today. Price effects and regulatory constraints can be included. Several drawbacks of this model are also discussed. The problem of data disaggregation by fuel, industry, and region is explored. Following the paper is a discussion, including applications of econometric models. (See also W76-09602) (Bell-Cornell)
W76-09611

ENERGY MODELS AND FORECASTS: A USER'S POINT OF VIEW,
Exxon Corp., New York. Corporate Planning Dept.
P. P. McCall.
In: Proceedings of the conference on Energy Modeling and Forecasting, Peter Benenson, et al (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 159-165. 1 fig.

Descriptors: *Energy, *Demand, *Forecasting, *Mathematical models, Linear programming, Oil, Industries, Supply, Technology, Fuels, Economics, Systems analysis.
Identifiers: Disaggregation, Fuel substitution, Functional demand.

During the past twenty years, Exxon has employed the forecasting methods of judgment and trend extrapolation. Energy demand forecasts for the individual units of the company were accurate, but forecasts for the total industry were low. Exxon's projections of the world energy supply indicated a flattening out of world oil production in the late 1980's or early 1990's, alerting them to the energy crisis. Currently Exxon uses a linear program for the world oil industry. It is highly disaggregated by geographical region, refining technology, transportation technology, and type of oil. It is used to forecast future oil prices and to provide a framework for facilities planning. The important components of an ideal energy model were outlined. Functional demand should be considered first in an energy model. Price, alternative supply technologies, fuel substitution, and the natural resource base also should be considered. Further, here is a need for disaggregation to incorporate these considerations and to monitor changes in trends. No all-purpose model is expected. The Brookhaven model is useful because it deals with functional demand, alternative supply technologies, and interfuel substitution. Its hierarchical structure renders it useful to policy makers. Following the paper is a discussion of the Exxon linear programming model. (See also W76-09602) (Bell-Cornell)
W76-09612

ENERGY MODELS AND FORECASTS: A USER'S POINT OF VIEW,
Pacific Gas and Electric Co., San Francisco, Calif.
R. L. Breen.
In: Proceedings of the Conference on Energy Modeling and Forecasting, Peter Benenson, et al. (Eds.), Lawrence Berkeley Laboratory, University of California, June 1974, p 167-170.

Descriptors: *Energy, *Forecasting, *Demand, *Mathematical models, Economics, Decision making, Costs, Systems analysis.
Identifiers: *Econometrics, Disaggregation, Credibility.

Econometrics can be used to complement modeling techniques such as input-output and process analysis to model the total energy system. Once this has been accomplished, high priority should then be attached to sectoral and regional disaggregation. This step is needed because policy decisions impact differently on different industries and geographical regions. A user's evaluation of a model takes into account (1) the policy question to be answered, (2) the level at which the decision will be made, and (3) the cost of the model. Concerning the first point, the policy issues must be clearly stated before the usefulness of a model can be determined. For example, a utility which must consider the issues of rate structure design, facilities planning, siting, and environmental impacts needs a regional model. Such models should be linked with more comprehensive national models, but the methods for doing this are not well developed. A particular problem is whether price determination takes place in the regional or the national model. Furthermore, once it is determined, by what method can it be incorporated in the model to which it is linked. A user of models also takes into account that decisions are made at several very dissimilar levels (national, regional and corporate); no single model can answer questions at all these levels. Finally, the model builder must be able to justify the costs of the model to the potential user. Models should be applied only to the uses for which they were intended. Discussed is the linkage problem. (See also W76-09602) (Bell-Cornell)
W76-09613

THE COST ASSIGNMENT OF THE COOPERATIVE WATER RESOURCE DEVELOPMENT: A GAME THEORETICAL APPROACH,
Tokyo Inst. of Tech. (Japan).
M. Suzuki, and M. Nakayama.
Management Science, Vol. 22, No. 10, p 1081-1086, June 1976. 4 tab, 7 ref.

Descriptors: *Water resources development, *Cost allocation, Linear programming, Rivers, Water supply, Agriculture, Optimization, Mathematical models, Systems analysis.
Identifiers: Cooperation, Game-theoretic approach, Japan.

As the demand for natural resources intensifies, the costs of further exploitation of these resources become enormous. These costs, in turn, require the development of a given resource to be a cooperative venture among several participants, each of whom must be assured that the costs and benefits of the venture will be 'fairly' distributed among them. It is at this point that the theory of cooperative games may offer guidelines as to what is fair or not fair to each participant or player in a given cost allocation. To illustrate an application of cooperative game theory in assigning 'fair' costs and benefits to the participants in a cooperative venture, an example problem in water resources is considered. A mathematical model of water resource development is applied to the case of Kanagawa prefecture in Japan, for which it is assumed that a dam will be constructed on the River Sakawa and that the diversion of water from agricultural use to city service is done in the basins of the Rivers Sakawa and Sagami. (Bell-Cornell)
W76-09619

DATA REQUIREMENTS FOR THE OPTIMIZATION OF RESERVOIR DESIGN AND OPERATING RULE DETERMINATION,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 4A.
W76-09622

THE DESIGN OF WATER QUALITY MANAGEMENT PROJECTS WITH INADEQUATE DATA,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 5G.
W76-09623

IMPROVED TECHNIQUES FOR WATER RESOURCE SYSTEMS DESIGN,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 4A.
W76-09624

MAXIMUM INFORMATION OBTAINABLE FROM INADEQUATE DESIGN DATA: FROM MULTIVARIATE TO BAYESIAN METHODS,
Arizona Univ., Tucson. Dept. of Management.
For primary bibliographic entry see Field 4A.
W76-09625

THE COST-EFFECTIVENESS OF WATER RESOURCES SYSTEMS CONSIDERING INADEQUATE HYDROLOGICAL DATA,
Technion - Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.
N. Buras.
In: Design of Water Resources Projects with Inadequate Data, Vol. 2, Proceedings of the Madrid Symposium, June 1973; Unesco - WMO - IAHS, Unesco - OMM - AISH, 1974, p 649-659. 2 fig, 2 tab, 9 ref.

Descriptors: *Water resources, *Hydrologic data, Projects, Design, Costs, Effects, Planning, Reservoirs, Water demand, Groundwater development, Probability, Equations, Decision making, Management, Mathematical models, Systems analysis.
Identifiers: *Cost effectiveness, *Inadequate data, Reservoir capacity.

How much hydrological information is necessary for the design of water-sources systems is not yet satisfactorily known. In general, the cost of a project decreases with the amount of available hydrological data. However, additional hydrological data involve increased cost, interms of more gauging stations and more costs incurred to society by delaying the design for data collection and processing. These two cost functions can be shown as two curves intersecting in the data-cost space; the parabola is the sum of the two functions. Adequate hydrological data is defined as the amount of information corresponding to the minimum ordinate of the total cost curve. Information in excess of this amount is as inadequate as not enough data, and may increase the project

cost. Insufficient data is used for information less than adequate, and redundant data for information in excess. Considered are the consequences of inadequate hydrological data on the cost and effectiveness of water resources structures and projects. Discussed is cost-effectiveness, flexibility in planning, reversible vs. irreversible decisions. For planning and design with inadequate data, two example problems are considered: (1) determining the capacity of a surface reservoirto satisfy a given demand; and (2) evolving a planning and management model of a groundwater development project. (Bell-Cornell)
W76-09626

OPTIMAL ACTIVATED SLUDGE DESIGN UNDER UNCERTAINTY,
Auburn Univ., Alabama. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W76-09628

OPTIMAL OPERATION OF THE PUMPING STATIONS IN THE KINNERETH-ESHKOL SECTION OF THE NATIONAL WATER CARRIER,
Mekoroth Water Co. Ltd., (Israel). Research and Desalting Div.; and Technion - Israel Inst. of Tech., Haifa.
For primary bibliographic entry see Field 4A.
W76-09629

INVESTIGATIONS INTO THE YIELD OF AN EXISTING SURFACE RESERVOIR AND AQUIFER SYSTEM,
Lancashire River Authority (England).
For primary bibliographic entry see Field 3B.
W76-09631

A COMBINED MODEL FOR OPERATING IRRIGATED AGRICULTURAL SYSTEMS UNDER UNCERTAINTIES,
Technion - Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-09634

AQUEDUCT OPTIMIZATION WITH INTERMEDIATE STORAGE,
California Univ., Berkeley. Lawrence Berkeley Lab.; and California Energy and Environment Div.
For primary bibliographic entry see Field 4A.
W76-09636

LEAST COST DESIGN OF ACTIVATED SLUDGE SYSTEMS,
Cornell Univ., Ithaca, N. Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W76-09638

A WATER-LAND USE MANAGEMENT MODEL FOR THE SEVIER RIVER BASIN PHASES I AND II,
Utah State Univ., Logan.
For primary bibliographic entry see Field 4A.
W76-09844

DEVELOPMENT OF A DYNAMIC PROGRAMMING MODEL FOR THE REGIONALIZATION AND STAGING OF WASTEWATER TREATMENT PLANTS,
Utah State Univ., Logan.
For primary bibliographic entry see Field 5D.
W76-09845

INVESTMENT SEQUENCING, ALLOCATION, AND LEARNING IN THE DESIGN OF WATER RESOURCES SYSTEMS: AN EMPIRICAL APPLICATION,
Harvard Univ., Boston, Mass. Graduate School of Business Administration.
G. C. Rausser, and C. E. Willis.
Water Resources Research, Vol. 12, No. 3, p 317-330, June 1976. 2 fig, 5 tab, 35 ref.

Descriptors: Water resources, *Design, *Investment, *Water allocation(Policy), Technology, Desalination, Costs, Decision making, Constraints, *California, Computers, Water supply, Water demand, Regional analysis, Estimation, Optimization, Equations, Mathematical models, Systems analysis, Water quality, *Cost allocation.
Identifiers: Quadratic programming, Integer programming, Sequencing, Cost minimization.

Four of the more important unresolved problems in the design of water resources systems involve a determination of methods to deal with technological progress (e.g., new desalting processes), availability of water from more than a single supply source, the rate of investment in the capital complex employed to exploit the resource along with the allocation of water once the capital complex is in place, and price sensitive demands for water. The importance of these issues is demonstrated, and a decision framework is advanced which formally incorporates each along with a new technique for solving large-scale investment-sequencing and water allocation problems. The allocation process is formulated as a quadratic programming problem, and the investment-sequencing process is specified as an integer programming problem. Four theorems are advanced which outline the consistency and convergence properties of this iterative approach. The framework is applied to an empirical situation in California with encouraging results. (Bell-Cornell)
W76-09846

METAGAME THEORY AND ITS APPLICATIONS TO WATER RESOURCES,
Waterloo University (Ontario). Dept. of Civil Engineering.
K. W. Hipel, R. K. Ragade, and T. E. Unny.
Water Resources Research, Vol. 12, No. 3, p 331-339, June 1976. 14 fig, 4 ref.

Descriptors: *Water resources, *Operations research, *Political aspects, Water pollution control, Management, Behavior, Equations, Feasibility, Decision making, Systems analysis.
Identifiers: *Metagame theory.

Metagame theory is a new scientific method that reconstructs classical game theory on a nonquantitative basis in order to analyze political conflicts. It is a positive descriptive approach that can be used for the political resolution of water resource conflicts. Quantitative methods of operations research may be integrated with the political analysis so as to arrive at solutions to water resource problems that are politically feasible as well as economically and technically feasible. Herein, various resource problems are formulated, and it is shown by two examples that classical game theory, which is based on the theory of rationality, does not work. The concepts of metagame theory are surveyed within a nonquantitative set theoretic framework. The conflicts examined illustrate the potential of metagame theory for analyzing water resource management problems. (Bell-Cornell)
W76-09847

A LINEAR PROGRAMMING MODEL FOR USE IN GUIDING URBAN FLOODPLAIN MANAGEMENT,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6F.
W76-09849

A PROPOSED ALGORITHM FOR THE SOLUTION OF THE LARGE-SCALE INVERSE PROBLEM IN GROUNDWATER,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 2F.
W76-09850

EFFECT OF SEQUENCE LENGTH N ON THE CHOICE OF ASSUMED DISTRIBUTION OF FLOODS,
IBM Thomas J Watson Research Center, Yorktown Heights, N. Y.
For primary bibliographic entry see Field 4A.
W76-09851

ESTIMATING SELECTED PARAMETERS FOR THE KENTUCKY WATERSHED MODEL FROM WATERSHED CHARACTERISTICS,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 2A.
W76-09852

PARAMETER OPTIMIZATION FOR WATERSHED MODELS,
New South Wales Univ., Kensington, Australia. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-09853

SPECIFICATIONS FOR CONTAINER FACILITIES BY SIMULATION,
O. Beeman, and G. Vallicelli.
In: Symposium On Modeling Techniques, Volume I: 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 23-42, 1975.

Descriptors: *Model studies, *Harbors, *Facilities, *Docks, Ships, Mathematical models, Simulation analysis, Operation and maintenance, Equipment, *Oregon.
Identifiers: *Container facilities, Shipping, Port facilities, Portland(Ore).

The cost of container facilities is now approaching $15,000,000 per berth. Concurrently, standby costs of a modern container vessel can exceed $20,000 per day. The high costs and high risks involved demand that rule of thumb planning be replaced by modern planning techniques, including simulation of the system to optimize its design and to assure that it is brought on-line at a proper time. The techniques described were originally devised to set performance specifications for a new container facility at the Port of Portland, Oregon. These techniques were used to analyze the following criteria and parameters: (1) required berth length, (2) queuing and servicing times per vessel, (3) berth utilization, (4) crane utilization, (5) yard equipment utilization, (6) type of equipment, (7) number of cranes and other container handling equipment, (8) general yard layout, (9) design of entry gate, and (10) number of shifts worked per day. In each case, the simulation was used to test the impact of changing berth scheduling, ship size, load per vessel, berth length, crane productivity, etc. Rather than using a single simulation for all problems, emphasis was placed on having the appropriate simulation for each given problem, and to tackle the problems at the lowest possible level. A large scale microsimulation was used in order to check the effect of all decisions on the entire system. (See also W76-09941) (Sims - ISWS)
W76-09943

6B. Evaluation Process

ENERGY POLICY AND ECONOMIC GROWTH,
Data Resources, Inc., Cambridge, Mass.

For primary bibliographic entry see Field 6A.
W76-09606

AN ECONOMIST'S VIEW OF THE OCEANS,
Yale Univ. New Haven, Conn.
For primary bibliographic entry see Field 6E.
W76-09617

METHODOLOGIES FOR THE DETERMINATION OF STREAM RESOURCE FLOW REQUIREMENTS: AN ASSESSMENT,
Utah State Univ., Logan. Dept. of Wildlife Science.
For primary bibliographic entry see Field 6G.
W76-09666

WATER AUTHORITY RATE MAKING,
Pennsylvania State Univ., University Park. Dept. of Economics.
For primary bibliographic entry see Field 6C.
W76-09717

URBAN STORMWATER MANAGEMENT--PROBLEMS, SOLUTIONS AND IMPACT: A SUMMARY OF INTERVIEWS,
Poertner (Herbert G.), Bolingbrook, Ill.
For primary bibliographic entry see Field 4C.
W76-09752

A FLOODPLAIN MANAGEMENT FRAMEWORK WITH STRUCTURAL AND NON-STRUCTURAL MEASURES,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 6F.
W76-09754

HYDROELECTRIC POWER POTENTIAL AT CORPS OF ENGINEERS PROJECTS. RECOMMENDATIONS AND EXECUTIVE SUMMARY,
Institute for Water Resources (Army), Fort Belvoir, Va.
R. L. Trisko.
IWR Research Report 75-R2, May 1975. 42 p.

Descriptors: *Energy, *Electric power production, *Hydroelectric plants, *Feasibility studies, Project feasibility, Pumped storage, Competing uses, Peaking capacity, Water resources, Limiting factors, Water supply, Fossil fuels, Environmental effects, Electric power rates, Electric power costs, Evaluation, Interest rates, Discount rates, Projections, Cost-benefit ratio, Federal project policy.
Identifiers: *Corps of Engineers projects, *Hydro/energy potential.

This summarization of the comprehensive report of the same title is prefaced by recommendations for the Corps of Engineers to study new projects previously considered unfeasible, of power potential at existing projects without power, and additions to existing projects with power. The Corps should re-examine operating rules at reservoirs with power installations in view of increased power values relative to other benefits, and the possibilities of enhancing or increasing power generation and capacity. The federal role in the development of pumped storage should be defined so that the economic, social, and environmental problems associated with the need for additional peaking power can be thoroughly analyzed and federal hydropower development and operation should emphasize increased sources of peaking power. The federal policy relating to the marketing of its hydropower should reflect present economic development, energy supplies, and costs and should permit market prices based on revised rate structures consistent with value. A single benefit-cost ratio should be deemphasized and project planning should stress maximum displacement of scarce fuels. Water resource development should be based on comprehensive assessments of long range water needs on regional and national bases, including requirements of thermal energy production and processing industries, as well as hydropower generation. (See also W76-09765) (Auen-Wisconsin)
W76-09764

HYDROELECTRIC POWER POTENTIAL AT CORPS OF ENGINEERS PROJECTS,
Institute for Water Resources (Army), Fort Belvoir, Va.
R. L. Trisko, A. Gilead, G. P. Johnson, and B. Sasaki.
IWR Research Report 75-R1, July 1975. 343 p. 26 fig., 63 tab., 111 ref.

Descriptors: *Energy, *Electric power production, *Hydroelectric plants, *Feasibility studies, Projections, Project feasibility, Reservoir operation, Federal project policy, Pumped storage, Peaking capacity, Pricing, Power marketing, Water resources, Project planning, Efficiencies, Economic feasibility, Evaluation, Model studies, Fuels, Electric power industry, Electric power costs.
Identifiers: *Corps of Engineers projects, *Hydro/energy potential.

An overview of hydropower potential in the context of energy and water resources and demands, energy economics, and federal policy, organization, and practices pertaining to hydropower development and marketing presents a framework within which the Corps of Engineers might conduct studies at existing projects and on streams susceptible of development by the Corps. The discussion focuses on energy resources, consumption, regional hydropower distribution, load curve, economic, and environmental perspectives; and potential displacement of fossil fuels through increased hydropower development is related to the selection of thermal alternatives, environmental and balance of payment implications, and pumped storage. The economics of hydroelectric power are evaluated as they relate to its complexities, standards based on interest rates, determination of power values, use of levelized costs, cost allocation, and electrical cost characteristics and trends. Appendices contain samples of hydropower values assigned by Federal Power Commission regional offices, long run fossil fuel thermal power generating real costs and economics. A computerized cost model for evaluating capacity is supplemented by examples of calculation results. The survey of federal hydropower marketing and rate making practices includes various rate schedules and a financial data summary. Federal power marketing practices detail overall power marketing and by agency. (See also W76-09764) (Auen-Wisconsin)
W76-09765

SECONDARY EFFECTS OF PUBLIC INVESTMENTS IN HIGHWAYS AND SEWERS.
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5G.
W76-09778

LANDSLIDE HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst., of Behavioral Science.
For primary bibliographic entry see Field 6F.
W76-09781

NATIONAL CONFERENCE OF DISTRICT CHIEFS, ALBUQUERQUE, NEW MEXICO, SEPTEMBER 28-OCTOBER 3, 1975--PROCEEDINGS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2A.
W76-09838

A WATER-LAND USE MANAGEMENT MODEL FOR THE SEVIER RIVER BASIN PHASES I AND II,
Utah State Univ., Logan.
For primary bibliographic entry see Field 4A.
W76-09844

METAGAME THEORY AND ITS APPLICATIONS TO WATER RESOURCES,
Waterloo University (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W76-09847

OFFSHORE PETROLEUM AND NEW ENGLAND - A STUDY OF THE REGIONAL ECONOMIC CONSEQUENCES OF POTENTIAL OFFSHORE OIL AND GAS DEVELOPMENT,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
T. A. Grigalunas.
Available from the National Technical Information Service, Springfield, Va., 22161, as COM-75-10717, $5.50 in paper copy, $2.25 in microfiche. University of Rhode Island Marine Technical Report No. 39, 1975. (Also Sea Grant). 114 p, 5 fig, 35 tab, 56 ref. SG 04-3-158-3.

Descriptors: *Oil industry, *Fossil fuels, *Resources development, *Economic impact, *Economic justification, Continental Shelf, New England, Massachusetts, Oil fields, Coasts, Models, Regional economics, Industries.
Identifiers: *Outer Continental Shelf, *Refineries, North Atlantic Ocean, Georges Bank.

Georges Bank, an historically prolific fishing ground off the coast of New England, is one of three areas along the Atlantic OCS of particular interest in terms of potential oil and gas reserves and production. A representation of the hypothetical development of individual Georges Bank oil and gas fields was constructed. Its results were used to make judgments about some of the implications of a buildup of a potential Georges Bank petroleum basin, i.e., a number of fields. A multi-industry, multiregional economic model was adapted to provide insights into the kinds of direct and indirect effects alternative offshore oil and gas and petroleum refinery developments could have on the region. Hypothetical production from a Georges Bank petroleum province is projected for consideration. The potential offshore petroleum and refinery investment is seen in two parts: direct investment demands associated with potential offshore petroleum development and potential refinery activity within New England. The regional economic consequences of the developments are projected and tabulated. The impacts on a coastal area, Bristol County, Massachusetts are used to illustrate the projections for a particular geographic unit. (Sinha-OEIS)
W76-09893

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

COST OF PRODUCING CROPS IN THE IRRIGATED SOUTHWEST, PART II: NEW MEXICO,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W76-09475

COST EFFECTIVENESS OF RELEASE PREVENTION CONTROLS FOR TRITIUM AND KRYPTON-85,
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5G.
W76-09506

COSTS AND HYGIENIC NECESSITY OF SEWAGE SLUDGE PASTEURIZATION IN SWITZERLAND,
Edgenoessische Technische Hochschule, Zurich (Switzerland). Inst. for Aquatic Sciences and Water Pollution Control.
For primary bibliographic entry see Field 5D.
W76-09542

ON THE CAPACITY-EXPANSION OF DESALINATION PLANTS AND STORAGE TANKS,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 3A.
W76-09618

THE COST ASSIGNMENT OF THE COOPERATIVE WATER RESOURCE DEVELOPMENT: A GAME THEORETICAL APPROACH,
Tokyo Inst. of Tech. (Japan).
For primary bibliographic entry see Field 6A.
W76-09619

THE COST-EFFECTIVENESS OF WATER RESOURCES SYSTEMS CONSIDERING INADEQUATE HYDROLOGICAL DATA,
Technion - Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 6A.
W76-09626

A PROCEDURE FOR ESTIMATING OFF-SITE SEDIMENT DAMAGE COSTS AND AN EMPIRICAL TEST,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4A.
W76-09632

LEAST COST DESIGN OF ACTIVATED SLUDGE SYSTEMS,
Cornell Univ., Ithaca, N. Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W76-09638

SUBSTITUTE CHEMICAL PROGRAM - INITIAL SCIENTIFIC AND MINIECONOMIC REVIEW OF CAPTAN.
Midwest Research Inst. Kansas City, Mo.
For primary bibliographic entry see Field 5C.
W76-09651

WATER AUTHORITY RATE MAKING,
Pennsylvania State Univ., University Park. Dept. of Economics.
J. G. Halteman, and O. H. Sauerlender.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-254 491, $5.50 in paper copy, $2.25 in microfiche. Research Publication 91, Institute for Research on Land and Water Resources, University Park, December 1975, 103 p, 9 tab, 21 fig, 59 ref, 4 append. OWRT B-052-PA(1), 14-31-0001-3930.

Descriptors: *Municipal water, Surface waters, Groundwater, *Cost comparisons, Tax rates, Interest rates, Water costs, *Rates, Performance, *Water utilization, Water wells, Regulation.
Identifiers: *Water authority, Rate making, *Private water firms, Water consumer, Level of utilization, Customer mix, Technological costs.

The performance of unregulated municipal water authorities and regulated private water firms is compared. Four study groups were selected. Authorities and private firms using 80 percent of supply from surface water formed groups one and two. The same type firms using 80 percent groundwater composed groups three and four. Cost comparisons between groups one and two showed that technological costs are lower for private firms than for municipal authorities, but that when the institutional differences of tax and interest are taken into account, private firms' costs are higher than those of the municipal authority. Factors consistently influencing cost significantly are customer mix, level of utilization, and output. Between 35 and 50 percent of variation in cost was explained by these variables. The analysis of well water firms -- both private and municipal authority -- was much less conclusive. Private firms have higher cost levels than municipal authorities over much of the relevant range of output. When the revenue and cost functions of the firms studied were examined it was concluded that rate of return regulation of municipal authorities would not be beneficial to the consumer. (Sink - Penn State)
W76-09717

IS THE SEPARATION OF SEWERS DESIRABLE,
Hydrotechnic Corp., New York.
For primary bibliographic entry see Field 5D.
W76-09739

HYDROELECTRIC POWER POTENTIAL AT CORPS OF ENGINEERS PROJECTS. RECOMMENDATIONS AND EXECUTIVE SUMMARY,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-09764

HYDROELECTRIC POWER POTENTIAL AT CORPS OF ENGINEERS PROJECTS,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-09765

FINANCING POLLUTION ABATEMENT EQUIPMENT FOR TEXTILES AND OTHER SOUTH CAROLINA INDUSTRIES.
Clemson Univ., S.C. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-09766

PRESENTATION CONCERNING POLLUTION CONTROL FACILITIES REVENUE BONDS,
Sinkler, Gibbs, Simon and Guerard, Charleston, S.C.
For primary bibliographic entry see Field 5G.
W76-09767

ROLE OF THE UNDERWRITER IN TAX EXEMPT FINANCING FOR INDUSTRIAL EXPANSION AND POLLUTION CONTROL,
Interstate Securities Corp., Charlotte, S.C.
For primary bibliographic entry see Field 5G.
W76-09768

THE INDUSTRIAL REVENUE BOND FOR POLLUTION CONTROL: ONE COMPANY'S PERSPECTIVE,
La France Industries, S.C.
For primary bibliographic entry see Field 5G.
W76-09769

FINANCING POLLUTION CONTROL PROJECTS IN SOUTH CAROLINA USING TAX-EXEMPT INDUSTRIAL REVENUE BONDS,
Spring Mills, Grace, S.C.
For primary bibliographic entry see Field 5G.
W76-09770

THE POLLUTION CONTROL BOND,
Clemson Univ., S. C. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-09771

A GUIDE TO THE SELECTION OF COST-EFFECTIVE WASTEWATER TREATMENT SYSTEMS,
Bechtel, Inc., San Francisco, Calif. Environmental Water Projects Dept.
For primary bibliographic entry see Field 5D.
W76-09772

WASTEWATER SLUDGE UTILIZATION AND DISPOSAL COSTS,
Gates (W. E.) and Associates, Inc., Fairfax, Va.
For primary bibliographic entry see Field 5D.
W76-09773

COSTS OF WASTEWATER TREATMENT BY LAND APPLICATION,
Metcalf and Eddy, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5D.
W76-09774

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: GRAIN PROCESSING SEGMENT OF THE GRAIN MILLS INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-09775

WATER USE POLICIES AND POWER PLANT ECONOMICS,
Houston Univ., Tex.
For primary bibliographic entry see Field 5G.
W76-09776

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: FERTILIZER INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-09777

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: APPLE, CITRUS AND POTATO PROCESSING SEGMENTS OF THE CANNED AND PRESERVED FRUITS AND VEGETABLE INDUSTRY,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-09779

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: INSULATION FIBERGLASS INDUSTRY.
Environmental Protection Agency, Washington, D.C. Office of Planning and Evaluation.
For primary bibliographic entry see Field 5G.
W76-09780

DEVELOPMENT OF A DYNAMIC PROGRAMMING MODEL FOR THE REGIONALIZATION AND STAGING OF WASTEWATER TREATMENT PLANTS,
Utah State Univ., Logan.
For primary bibliographic entry see Field 5D.
W76-09845

6D. Water Demand

SUMMARY OF MUNICIPAL WATERSHED MANAGEMENT SURVEYS IN EASTERN UNITED STATES,
Southeastern Area State and Private Forestry, Atlanta, Ga.
For primary bibliographic entry see Field 4D.
W76-09466

ARIZONA ENERGY: A FRAMEWORK FOR DECISION.
Arizona Univ., Tucson.
Arizona Academy, Phoenix, 28th Arizona Town Hall Research Report, April, 1976. 154 p, 34 tab, 24 fig, 69 ref. $5.00.

Descriptors: *Electric power production, *Arizona, *Energy conversion, *Water management(Applied), *Water utilization, *Water allocation(Policy), Energy, Hydroelectric power, Tidal energy, Thermodynamics, Planning, Thermal pollution, Air pollution, Water quality standards, Nuclear powerplants, Water cooling, Fossil fuels, Coals, Conservation, Geothermal studies, Water reuse, Waste water disposal, Colorado River.
Identifiers: *Biological energy sources, *Solar energy.

Technical and planning-related information on Arizona's energy needs and resources are presented, with some specific attention to the potentials of hydropower and to water use for extraction and conversion of energy minerals and for cooling in thermal power generation. Material is presented on the state's energy economy including discussion of supply sources and consumption patterns, technical explanations of energy conversion and use, potential energy sources and their availability, and decision-making issues and prospects. Although coal is abundant, large quantities of water are needed to process it, as well as for gasification. Hydropower cannot compete in output with the coal-fired Navajo Generating Station at Page, Arizona, because of a lack of enough suitably placed river water. Pumped storage for secondary hydroelectric generation is an economical way of providing required peaking power. Water needs for processing and cooling are outlined; the Navajo station, for instance, uses 13.5 acre-feet of water per year for each megawatt produced. Sources include surface, ground and waste water; groundwater is most versatile and abundant, but overdraft is becoming widespread and supplies are limited. Waste water discharge and reuse potentials are also described. Legal questions concerning Colorado River water use and thermal pollution problems are discussed. (Jahns-Arizona)
W76-09484

POWER GENERATION IN ARIZONA AND ITS ENVIRONMENTAL IMPLICATIONS,
Arizona Univ., Tucson. College of Engineering, Engineering Experiment Station.
S. E. Smith.
EES Series (1976) Report No. 47. 215 p, 46 fig, 41 tab, 101 ref, 4 append.

Descriptors: *Electric power production, *Hydroelectric plants, *Nuclear powerplants, *Arizona, *Thermal powerplants, *Water demand, Industrial water, Powerplants, Electric power costs, Colorado River, Coals, Turbines, Environmental effects, Economic efficiency, Water consumption(Except consumptive use), Fuels, Electric power, Effluents, Radioactive waste, Water pollution.
Identifiers: Gas turbines.

Information is presented on hydroelectric, coal-fired, gas turbine and nuclear power generation with analyses of their respective natural resource demands and impacts in Arizona. Comparisons are made between different types of power plants as to the amount of land and water needed to sustain that generation process. Most power plants require substantial amounts of water to cool condensers; tables are provided showing the water use pattern of different plant designs and input-use balance data for the state. The percentage contribution of hydropower to Western electrical needs has decreased steadily since 1950; as the number of conventional thermal power plants has increased, hydroelectric power has assumed less of a base load and more of a peak load service role. Coal is most abundant, but its extraction causes more serious ecological damage. The advantages and disadvantages of these power generation systems are described with respect to economic and environmental impacts, including water use and pollution. (Jahns-Arizona)
W76-09485

ENERGY MODELING AND FORECASTING.
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 6A.
W76-09602

ENERGY PROJECTIONS--RELATIONSHIP TO POLICY ISSUES,
Brookhaven National Lab. Upton, N.Y. Energy Systems Analysis Group.
For primary bibliographic entry see Field 6A.
W76-09603

COUPLED ENERGY SYSTEM-ECONOMIC MODELS,
Brookhaven National Lab., Upton, N.Y. Energy Systems Analysis Group.
For primary bibliographic entry see Field 6A.
W76-09605

METHDOLOGICAL ISSUES IN THE ECONOMETRIC ESTIMATION OF ENERGY DEMAND ELASTICITIES,
Wharton School of Finance and Commerce, Philadelphia, Pa. Dept. of Economics.
For primary bibliographic entry see Field 6A.
W76-09607

ENERGY SYSTEMS: MODELING AND POLICY PLANNING,
Massachusetts Inst. of Tech. Cambridge. Energy Lab.
For primary bibliographic entry see Field 6A.
W76-09608

THE USE OF ECONOMETRICS TO PROJECT ENERGY DEMANDS,
Data Resources, Inc., Lexington, Mass.
For primary bibliographic entry see Field 6A.
W76-09611

ENERGY MODELS AND FORECASTS: A USER'S POINT OF VIEW,
Exxon Corp., New York. Corporate Planning Dept.
For primary bibliographic entry see Field 6A.
W76-09612

ENERGY MODELS AND FORECASTS: A USER'S POINT OF VIEW,
Pacific Gas and Electric Co., San Francisco, Calif.
For primary bibliographic entry see Field 6A.
W76-09613

PROBLEMS AND SOLUTIONS IN ESTIMATING THE DEMAND FOR AND VALUE OF RURAL OUTDOOR RECREATION,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
R. L. Gum, and W. E. Martin.
American Journal of Agricultural Economics, Vol. 57, No. 6, p 558-566, November 1975. 4 tab, 13 ref.

Descriptors: *Recreation demand, *Estimating, *Rural areas, *Regional analysis, Mathematical models, Resource allocation, Value, Methodology, Evaluating, Arizona, Fishing, Hunting, Costs, Regression analysis, Equations, Systems analysis.

An improved methodology for estimating demand functions for outdoor recreation and evaluating the outdoor recreation resource by use classification is presented. The illustrative framework is a large-scale empirical study of all outdoor recreation activities in all areas of Arizona. The first step of the analysis is to estimate statistical demand relationships for the recreation experience as a whole. Demand relationships were derived for: (a) deer hunting; (b) other big game hunting; (c) small game hunting; (d) waterfowl hunting; (e) predator hunting; (f) cold water fishing; (g) warm water fishing; and (h) general rural outdoor recreation for each of the seven Arizona Department of Fish and Game regions in the state where more than twenty-five area-activity observations were obtained. The use of the improved procedures produces estimates of resource values which are much larger than in most previous studies and which are about the size of estimates of gross variable expenditures. It is argued that the time has come to relax the search for improved estimating methodology and concentrate on interpretation of the estimates in studies of resource allocations. (Bell-Cornell)
W76-09633

AN ASSESSMENT OF ESTUARINE AND NEARSHORE MARINE ENVIRONMENTS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 6G.
W76-09665

INVESTMENT SEQUENCING, ALLOCATION, AND LEARNING IN THE DESIGN OF WATER RESOURCES SYSTEMS: AN EMPIRICAL APPLICATION,
Harvard Univ., Boston, Mass. Graduate School of Business Administration.
For primary bibliographic entry see Field 6A.
W76-09846

6E. Water Law and Institutions

JOINT USA/JAPAN PROJECT ON GLOBAL SYSTEMS ANALYSIS AND SIMULATION (GLOSAS) OF ENERGY, RESOURCES, AND ENVIRONMENTAL (ERE) SYSTEMS,
Japan GLOSAS Project Committee, Tokyo.
For primary bibliographic entry see Field 6A.
W76-09610

AN ECONOMIST'S VIEW OF THE OCEANS,
Yale Univ. New Haven, Conn.
R. N. Cooper.
In: Perspectives on Ocean Policy, Conference on Conflict and Order in Ocean Relations, October 21-24, 1974, Airlie, Virginia, p 143-165. 3 fig, 8 ref, append. (Prepared for NSF by Johns Hopkins University, Washington, D. C.)

Descriptors: *Oceans, *Management, *Economic efficiency, *Fisheries, Benefits, Optimization, Water pollution, Mathematical models, Equations, Systems analysis.
Identifiers: Scarcity rent, Maximum sustainable yield, Shipping, Seabed minerals, National security.

Taken is a global perspective in analyzing how better ocean management can maximize benefits to the world at large. The oceans are no longer a free common resource, but have taken on economic value commanding scarcity rent. Efficient use of the oceans requires limiting access to those willing to pay this rent; suggested are principles for collecting the rent. Ocean fisheries are analyzed in detail. It is found necessary that the rent be prevented from influencing entry and investment in the industry; a charge could be levied on all those engaged in the fishing industry. Such an arrangement would increase efficiency and would generate substantial revenues that could be used for developmental purposes and other interests of the international community. For optimal management of fisheries along these lines,

fishstocks need be generally kept larger than is suggested by the principle of maximum sustainable yield. While methods of maximizing the gains from ocean's resources need not be a source of conflict, the distribution of the gains is a potential source of disagreement, and they should be used mainly to serve global objectives, such as economic growth of developing countries. Development of accurate scientific and economic information is imperative for an efficient management system. Appended to this article is a simple mathematical model of a fishery and a guide to optimum management. (Bell-Cornell)
W76-09617

NEPA AND A STATE'S ROLE IN WATER RESOURCES MANAGEMENT,
New York State Dept. of Environmental Conservation, Albany.
T. P. Curran, and T. W. King, Jr.
Water Resources Bulletin, Vol. 10, No. 1, p 127-136, February 1974.

Descriptors: *Water resources, *Management, *Environment, New York, Legislation, Projects, Federal government, Decision making.
Identifiers: *Environmental impact, *National Environmental Policy Act.

The National Environmental Policy Act of 1969 has been called a revolutionary piece of legislation. It has changed, and is still changing, the traditional ways of governmental decision-making. NEPA has strongly influenced the field of water resources management. An environmental statement can now be seen not as a document to support or justify a plan, but an objective assessment of what environmental costs and benefits are involved. New York State has seized upon NEPA as an important feature of its environmental quality management programs and has used the opportunity to comment upon draft environmental statements under NEPA to increase its influences upon Federal decision making. The Department of Environmental Conservation coordinates and synthesizes all comments and provides one unified State response on a statement. At the State level, lacking a comprehensive 'little NEPA,' an extensive environmental analysis program has been built by utilizing a wide spectrum of Federal and State Laws and administrative regulations. (Bell-Cornell)
W76-09627

REPORT TO THE CONGRESS BY THE NATIONAL COMMISSION ON WATER QUALITY,
National Commission on Water Quality, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-09663

LEGAL APPROACHES TO CONTROL RUNOFF AND SEDIMENTATION: A CASE STUDY OF GEORGIA,
The Research Group, Inc., Atlanta, Ga.
For primary bibliographic entry see Field 4D.
W76-09747

MUNICIPAL STORM WATER MANAGEMENT PROGRAMS,
Lindley and Sons, Inc., Hinsdale, Ill.
For primary bibliographic entry see Field 4A.
W76-09751

6F. Nonstructural Alternatives

A FLOODPLAIN MANAGEMENT FRAMEWORK WITH STRUCTURAL AND NON-STRUCTURAL MEASURES,
Massachusetts Univ., Amherst. Water Resources Research Center.
J. L. Kaul, C. E. Willis, and J. H. Foster.
Available from the National Technical Information Service, Springfield Va., 22161, as PB-254 544, $5.50 in paper copy, $2.25 in microfiche. Publication No. 61, Completion Report FY-76-8, October 1975. 114 p, 3 fig, 27 tab, 209 ref, 5 append. OWRT B-043-MASS(5) 14-31-0001-5081.

Descriptors: Management, *Connecticut, *Nonstructural alternatives, Cost analysis, Cos-benefit analysis, Warning systems, *Flood protection, Flood plain insurance, Decision making, *Flood plain zoning.
Identifiers: Farmington(Conn).

A decision framework is developed which describes the results of an investigation of the economic potential of structural as well as nonstructural measures for a floodplain in Farmington, Connecticut. The analysis demonstrates the potential usefulness of operations research methods to flood zone decision makers. A review of the literature is included. Components of the decision framework are developed, regional application is attempted, the distributional equity impacts of the alternative measures are discussed. It is clearly feasible to develop an operations research framework, featuring the floodplain management alternatives considered here, which: treats rent or land values as a function of level of development; is capable of considering interrelationships among uses; is capable of formally reflecting planners' aversion to uncertainty; and which provides for early period decisions which are conditional upon forecast later period situations.
W76-09754

LANDSLIDE HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst., of Behavioral Science.
J. H. Sorensen, N. J. Ericksen, and D. S. Mileti.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 979, $5.00 in paper copy, $2.25 in microfiche. Report No. NSF-RA-E-016, June 1975. 90 p. 9 fig., 11 tab., 48 ref. NSF GI 32942.

Descriptors: *Landslides, *Research priorities, *Hazards, *Costs, Land use, Damages, Social impact, Protection, Warning systems, Land management, Rehabilitation, United States, California, Colorado, Forecasting, Insurance, Probability, Regulation.
Identifiers: Research needs, Case studies, San Jose(Calif), San Francisco(Calif), Los Angeles(Calif).

Research requirements for landslide hazards are proposed relating to both the reciprocal actions to landslides by protection, prediction, land use management, disaster preparedness, relied and rehabilitation, and insurance (by increasing the limits of coverage for the National Flood Insurance Program) together with constraints mitigating against the effectiveness of the reciprocal actions. A description of each research need is presented, then a framework for examining those proposals is suggested. Levels of expenditures believed to be required for the successful outcome of the research are provided. The needs for research are substantiated by discussions of the nature of landslides and their regional distribution. Human adjustment to landslides is defined by classifying adjustments, the nature, responsibility, effectiveness, and cost of such actions and constraints on their adoption, adjustment trends, and interaction and combination of adjustments. The national cost of landslides is defined, citing two case studies in California, and the catastrophe potential, and cost distribution. Exogenous forces affecting landslides are cited as population growth, environmental concerns, and the public energy policy with its impact on landslide potential. (Auen-Wisconsin)
W76-09781

A LINEAR PROGRAMMING MODEL FOR USE IN GUIDING URBAN FLOODPLAIN MANAGEMENT,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
J. C. Day, and R. N. Weisz.
Water Resources Research, Vol. 12, No. 3, p 349-359, June 1976. 1 fig, 6 tab, 42 ref, 2 append.

Descriptors: *Flood plains, *Management, *Linear programming, *Flood control, Optimization, Engineering, Economic efficiency, Land use, Constraints, Alternative planning, Operations research, Mathematical models, Equations.
Identifiers: *Urban planning, Land use allocation, Site elevation, Time variables, Maximization model, Regression equations.

Modern planning seeks better solutions to urban flood problems through floodplain management practices involving coordinated land use and engineering approaches. Land use control can be integrated with dams, levees, channel works, etc., but the physical and economic interrelationships must be taken into account. Trade-offs require quantification of the economic impacts of dissimilar alternatives. Herein, a linear programming land use assignment model is combined with discrete sets of public land acquisition and engineering works. Solution of the management system yields an economically desirable mix of measures which can be constrained by noneconomic conditions. Empirical testing of the approach and sensitivity analysis verify that useful planning guidelines for large and small urban areas alike can be produced. The computational technique presented herein is applied to the Tucson situation to determine the optimum combination of flood control works and land development policies; information helpful for floodplain management is yielded. (Bell-Cornell)
W76-09849

6G. Ecologic Impact Of Water Development

POWER GENERATION IN ARIZONA AND ITS ENVIRONMENTAL IMPLICATIONS,
Arizona Univ., Tucson. College of Engineering, Engineering Experiment Station.
For primary bibliographic entry see Field 6D.
W76-09485

THE SAHELIAN DROUGHT AND ITS DEMOGRAPHIC IMPLICATIONS,
Australian National University, Canberra, Department of Demography.
J. C. Caldwell.
American Council on Education, Overseas Liason Committee, Paper No. 8, December, 1975. 88 p, 4 tab, 1 fig, 103 ref.

Descriptors: *Droughts, *Human population, *Africa, *Arid lands, *Environmental effects, Grasslands, Mortality, Crop production, Land use, Livestock, Weather patterns, Weather data, Water resources development, Planning, Migration.
Identifiers: *Sahel, Nomads.

The Sahelian drought region and its demography are analyzed with specific attention to fertility control, effects on population and mortality rates, savannah imbalance, nomadic-sedentary relationships and general reactions of the population to the drought condition. Sahelian population will increase by about 17 million in the next 25 years. Growth rates among nomads could force sedentarization of considerable numbers of these people. Possible weather changes and past trends are described, along with the effect on herds, crop production and pasturage. Large-scale irrigation appears limited in usefulness and too costly. The region had received two seasons of satisfactory rainfall by the end of 1975, and emergency relief

had mostly been replaced by 'medium-term development' and 'long-term assistance' programs aimed at increasing food production and improving the savannah's position as a provider of livestock meat for coastal countries. (Jahns-Arizona)
W76-09486

COMBINED EFFECTS OF RADIOACTIVE, CHEMICAL AND THERMAL RELEASES TO THE ENVIRONMENT,
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5C.
W76-09490

NEPA AND A STATE'S ROLE IN WATER RESOURCES MANAGEMENT,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 6E.
W76-09627

ENVIRONMENTAL QUALITY RESEARCH, FIRST ANNUAL REPORT,
California Univ., Irvine.
For primary bibliographic entry see Field 5C.
W76-09654

PHYSIOLOGIC RESPONSES TO WATER IMMERSION IN MAN: A COMPENDIUM OF RESEARCH,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
For primary bibliographic entry see Field 10C.
W76-09655

AN ASSESSMENT OF ESTUARINE AND NEARSHORE MARINE ENVIRONMENTS,
Virginia Inst. of Marine Science, Gloucester Point.
Report No. FWS/OBS-76/05, March 1976. 132 p, 3 fig, 34 tab, 209 ref. Editors: Lynch, M. P., Laird, B. L., Theberge, N. B., and Jones, J. C.

Descriptors: *Estuarine environment, *Water demand, *Estuarine fisheries, Recreation demand, Water management(Applied), Commercial fishing, Marine animals, Income analysis, Evaluation, Environmental effects, Regional analysis, Wildlife management.
Identifiers: National Water Resources Assessment.

The impacts of water uses and projected water demands upon the estuarine and nearshore marine environments of the United States have been evaluated as part of the 1975 National Water Resources Assessment. The evaluation included a regional review of major estuarine nearshore marine habitats, major problems impacting water and water resources, the management approach of the states, and Federal management initiatives, particularly Federal-State interactions. Geological history, tidal amplitude, weather, currents, latitude, and estuarine environments are described for each region. Estuarine resource harvest and projections are given for commercial fisheries, sport fishing, waterfowl, other wildlife harvest, bird watching, and recreational boating. Conflict areas include domestic versus foreign fleets, commercial versus sport fishing, subsistence versus commercial harvest activities. Future harvest and recreational projections include demand/supply of fisheries products, and recreation and hunting demands. Impacts of predicted water resource utilization include demand/supply, patterns of water use, seasonal and annual freshwater outflows, and effects of increased comsumptive use. Appendixes include a partial list of estuarine dependent and nearshore marine species, a list of species under each waterfowl harvest category, projected changes in population for water resource regions, projected per capita income for water resource regions, and present status of selected species of interest to. U. S. fishermen. (Fish and Wildlife Service)
W76-09665

METHODOLOGIES FOR THE DETERMINATION OF STREAM RESOURCE FLOW REQUIREMENTS: AN ASSESSMENT,
Utah State Univ., Logan. Dept. of Wildlife Science.
C. B. Stalnaker, and J. L. Arnette.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 152, $7.75 in paper copy, $2.25 in microfiche. U.S. Fish and Wildlife Service, Office of Biological Services, Report No. FWS/OBS-76/03, 1976, 199p.

Descriptors: Water quality, Measurement, Environmental effects, Water resources, Flow, Flow control, Flow measurement, Wildlife, Aquatic biology, Fish, Mathematical models, Recreation facilities, Aesthetics, Reviews, Research priorities, Methodology, Model studies, Evaluation.

Techniques for establishing instream flow requirements and assessing the effects of changing stream flows, are summarized and evaluated. The state-of-the-art summation is intended to provide a basis for further work in developing methodologies and defining research needs. Standard nomenclature is presented. Basic stream flow measurements and relationships are described and methodologies for evaluating water quality in streams and estuaries in relation to flow changes are examined. Methods for assessing instream flow needs for fish, other aquatic life, and terrestrial wildlife are discussed. Problems of determining the impact of stream flow changes on recreational activities and aesthetic values are considered. (Fish and Wildlife Service)
W76-09666

THE CONTRIBUTION OF A WATER INFORMATION SYSTEM FOR ENVIRONMENTAL PLANNING IN MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Geography.
B. R. Higgins.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-254 626, $5.00 in paper copy, $2.25 in microfiche. Water Resources Research Center Bulletin 86, University of Minnesota. March 1976. 70 p, 19 fig, 3 tab. OWRT A-031-MINN(2).

Descriptors: *Minnesota, *Planning, *Environment, *Attitudes, Data collections, Information exchange, Social values, Social change, Watershed management, Land use, Water quality, Lakes, Fish.
Identifiers: *Information systems, *Environmental planning, Information dissemination, Housing, *Swan River Watershed(Minn).

A conceptual design of a computerized statewide water information system is devised in order to use existing land and water data together for environmental planning decisions. In order to specifically demonstrate the potential of such a system, a case study area was chosen, the Swan River Watershed in southeastern Itasca County, and the rudiments of a water information system were constructed. Research being conducted by the Center for Urban and Regional Affairs of the University of Minnesota and the State Planning Agency has produced a computerized land management data base for the Arrowhead planning region which includes Itasca County, Minnesota. In this system there are already some variables which are considered water information variables. These include: flood potential for urban residential land use; drainage class of soil landscape unit; wetness problem for urban residential construction; septic tank limitations for urban residential construction; groundwater contamination potential for urban residential construction; land use; and water orientation. By including other water variables which were available, a more complete environmental planning methodology may be constructed and environmental policy modified. The following water variables were computer coded for each forty acre parcel in the Swan River Watershed: watershed boundaries; Minnesota Pollution Control Agency water quality classification; Minnesota Department of Natural Resources; water appropriation permits; Minnesota Pollution Control Agency point source discharge; Lakeshore Study lakeshore physical combinations; lake fish type; lake crowding potential; and lake relative water crowding. To demonstrate, clarify, and elaborate a possible planning approach, the topic of housing was discussed in terms of water and environmental planning.
W76-09753

ASSESSING POTENTIAL OCEAN POLLUTANTS,
National Academy of Sciences, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-09889

COASTAL WATER RESEARCH PROJECT. ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 1975,
Southern California Coastal Water Research Project, El Segundo, Calif.
For primary bibliographic entry see Field 5B.
W76-09899

LAND USE CHANGES AND RESERVOIR DEVELOPMENT: AN APPLICATION OF LAND USE INFORMATION SYSTEMS,
Oklahoma State Univ., Stillwater. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W76-09905

ENVIRONMENTAL IMPACT STUDY OF OFFSHORE SAND AND GRAVEL MINING,
National Oceanic and Atmospheric Administration, Tiburon, Calif. Marine Minerals Technology Center.
H. D. Hess.
Marine Technology Society Journal, Vol 7, No 1, p 49-52, January-February 1973. 5 fig.

Descriptors: *Mining, *Dredging, *Environmental effects, Model studies, Continental Shelf, New England, Sands, Gravels, Monitoring, Massachusetts, Planning.
Identifiers: *Outer Continental Shelf, *Environmental impact, *Offshore technology, United Kingdom, Massachusetts Bay, New England Offshore Mining Environmental Study(NOMES).

The New England Offshore Mining Environmental Study (NOMES) is a four-year, NOAA-sponsored, cooperative federal/state experiment designed to assess the environmental impact of offshore sand and gravel mining. The project will include monitoring a short duration dredging operation in Massachusetts Bay and determining by field tests and laboratory studies the nature, magnitude, and impact of resultant environmental disturbances. Prediction techniques, developed through complementary laboratory testing and modeling, will enable planners and decision-makers to estimate the general nature of the environmental impact. Through the data generated and environmental guidelines developed, Project NOMES will provide a scientific basis for establishing realistic environmental safeguards over any future offshore mining operations of this type. The experiment obviously will not provide immediate answers to all of the questions concerning the effects of marine sand and gravel mining on the environment in all potentially promising offshore areas. However, it will provide the beginnings of an understanding of the broad cause-

and-effect relationships involved and assist decision making through sounder judgments based on predictive models. (Sinha - OEIS)
W76-09910

ACADEMIC DATA-NEEDS FOR ENVIRONMENTAL ASSESSMENTS OF OFFSHORE TECHNOLOGICAL OPERATIONS,
New York Ocean Science Lab., Montauk.
R. Nuzzi.
Marine Technology Society Journal, Vol 9, No 5, p 25-28, July 1975. 7 ref.

Descriptors: *Baseline studies, *Environmental effects, Resources development, *Water quality control, Ecosystems, Monitoring, Continental Shelf.
Identifiers: *Outer Continental Shelf, *Offshore technology, Environmental impact.

Questions currently being asked cannot be answered concerning environmental impact because technology, as generally thought of in the phrase 'offshore technology,' is years ahead of science. While we have the technical ability to build bridges, or offshore power stations, or drill for oil in 300 feet of water, we do not yet have the ability to predict the consequences of these activities in ecological terms. We must face up to the realization that the conclusions of most environmental impact statements as they are performed today, are based on relatively easily obtainable information, but certainly not on all the information that is required to answer some very pertinent questions. Baseline studies and monitoring of chemical, physical and biological properties should be initiated immediately in areas that are expected to be impacted by offshore technological operations, however, one year baseline studies are not considered adequate for proper characterization of an area. Instruments and techniques need to be developed for more meaningful baseline and monitoring studies. No parameter can be disregarded simply because instrumentation and/or economical techniques for its study are currently unavailable. Laboratory studies investigating the function and interactions of species, populations and communities within the ecosystem must be initiated. (Sinha-OEIS)
W76-09914

USE OF THE PRINCIPLES AND METHODS OF RADIO-ECOLOGY IN SOLVING SOME URGENT PROBLEMS OF MAN'S EFFECT ON THE ENVIRONMENT, (IN RUSSIAN),
R. M. Aleksakhin.
Ekologiya. 4(4), p 51-56, 1973.

Descriptors: *Radioecology, Methodology, Environmental effects, Elements(Chemical), Model studies, Path of pollutants, Ecological distribution.
Identifiers: *Biogeocoenoses.

Principles, methods and achievements of radioecology in the study of man's effect on the environment and the migration of chemical elements in biogeocoenoses are discussed. The increase in the number of atomic power plants and the possibility of release of radioactive substances into the environment are evaluated. Dynamic models for studying the cycle of radionuclides in biogeocoenoses are described.--Copyright 1975, Biological Abstracts, Inc.
W76-09936

7. RESOURCES DATA

7A. Network Design

IMPROVED TECHNIQUES FOR WATER RESOURCE SYSTEMS DESIGN,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 4A.
W76-09624

MAXIMUM INFORMATION OBTAINABLE FROM INADEQUATE DESIGN DATA: FROM MULTIVARIATE TO BAYESIAN METHODS,
Arizona Univ., Tucson. Dept. of Management.
For primary bibliographic entry see Field 4A.
W76-09625

REGRESSION ANALYSIS AND PARAMETER IDENTIFICATION,
Geological Survey, Reston, Va.
N. C. Matalas.
In: Hydrological Network Design and Information Transfer; Proceedings of international seminar, held at Newcastle upon Tyne, U K, August 19-23, 1974: World Meteorological Organization Operational Hydrology Report No 8 (WMO No 433), p 47-50, 1976. 6 ref.

Descriptors: *Streamflow, *Model studies, *Network design, *Regression analysis, Statistical method, Analytical techniques, Evaluation.

A procedure of streamflow network design is outlined using regression relations and assuming levels of acceptable errors in estimating the values of statistical parameters. Problems arise in the implementation of the procedure. One of these problems relates to the compounding of model and time errors. The term model error refers to the classical standard error of regression, whereas, the term time error refers to the error introduced by regressing estimates of the values of statistical parameters rather than the true values themselves on the values of the physiographical and meteorological variables. Another problem pertains to the relationship between the values of the statistical parameters needed to meet the condition of homoscedasticity in the regression relation. (Woodard-USGS)
W76-09824

SAMPLING NETWORK DESIGN FOR DISPERSION VERIFICATION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-09961

7B. Data Acquisition

ISLAND BARRIER EFFECTS ON SEA STATE AS REVEALED BY A NUMERICAL WAVE MODEL AND DMSP SATELLITE DATA,
Environmental Prediction Research Facility, Monterey, Calif.
For primary bibliographic entry see Field 2L.
W76-09559

RESEARCH AND INVESTIGATION OF GEOLOGY, MINERAL, AND WATER RESOURCES OF MARYLAND.
Geological Survey, Baltimore. Maryland
For primary bibliographic entry see Field 4A.
W76-09565

DIFFERENTIATION OF SERPENTINITIC FROM NON-SERPENTINITIC ULTRAMAFIC ROCKS IN ERTS-1 MSS IMAGERY,
Geological Survey, Baltimore, Maryland.
For primary bibliographic entry see Field 4A.
W76-09566

OBSERVATION OF LINEAR FEATURES IN THE MARYLAND PIEDMONT AS SHOWN ON ERTS-1 MSS IMAGERY AND AIRCRAFT SUPPORT PHOTOGRAPHY,
Geological Survey, Baltimore, Maryland.
For primary bibliographic entry see Field 4A.
W76-09567

MARYLAND CHESAPEAKE BAY BEACHES - GENERAL DISTRIBUTION AND CLASSIFICATION,
Geological Survey, Baltimore, Maryland.
For primary bibliographic entry see Field 2L.
W76-09568

THE RELATIONSHIP OF THE NEARSHORE LONGSHORE BAR AND SAND WAVES AT OCEAN CITY, MARYLAND,
Geological Survey Baltimore, Maryland.
For primary bibliographic entry see Field 2L.
W76-09569

LINEAR DISTRIBUTION OF THE HIGH MARSH VEGETATION COMMUNITIES OF THE LOWER EASTERN SHORE AND ITS GEOLOGICAL SIGNIFICANCE,
Geological Survey, Baltimore, Maryland.
For primary bibliographic entry see Field 2L.
W76-09570

VISUAL OBSERVATION OF THE SUSPENDED SEDIMENTS AND NEARSHORE ICE SIGNATURES IN CHESAPEAKE BAY,
Maryland Geological Survey, Baltimore.
For primary bibliographic entry see Field 2L.
W76-09571

ACCURACY OF RESERVOIR INFLOW FORECASTS BASED ON RADAR RAINFALL MEASUREMENTS,
Karlsruhe Univ. (West Germany). Institut fuer Wasserbau III.
For primary bibliographic entry see Field 2B.
W76-09574

METHODS FOR MEASUREMENT OF BIODEGRADABILITY OF CHEMICAL COMPOUNDS,
Akzo Research Lab., Arnhem (Netherlands).
For primary bibliographic entry see Field 5C.
W76-09599

DISSOLVED OXYGEN ANALYZER T-01 ANALYZER. A SIMPLE APPARATUS FOR ELECTROCHEMICAL DETERMINATION OF DISSOLVED OXYGEN IN WATER (TLENOMIERZ T-01 UPROSZCZONY PRZYRZAD ELEKTROCHEMICZNEGO OZNACZANIA TLEUNU ROXPUSZCZOMEGO W ROZTWORACH WODNYCH),
For primary bibliographic entry see Field 5A.
W76-09688

AN UNDERWATER TEMPERATURE-DEPTH DATA COLLECTION DEVICE,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 2H.
W76-09727

PLANKTON ANALYSIS TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio.
For primary bibliographic entry see Field 5C.
W76-09782

DETERMINATION, STORAGE, AND PRESERVATION OF LOW MOLECULAR WEIGHT HYDROCARBON GASES IN AQUEOUS SOLUTION,
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 2K.
W76-09834

OPERATION AND MAINTENANCE OF A DEEP-WELL WATER-LEVEL MEASUREMENT DEVICE, 'THE IRON HORSE',
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-09835

PROPOSED REVISION TO THE MODIFIED EINSTEIN METHOD OF COMPUTING TOTAL SEDIMENT DISCHARGE,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W76-09842

TEN YEARS OF EXPERIENCE WITH AUTOMATIC PUMPING-SEDIMENT SAMPLERS,
Geological Survey, Parkville, Md.
T. H. Yorke.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 100/3GI (Proceedings). Printed copy $23.75, Microfiche $15.00. Reprint from Proceedings of the Third Federal Inter-Agency Sedimentation Conference, 1976, held at Denver, Colorado, March 22-25, 1976: Water Resources Council, Sedimentation Committee, p 7-54 - 7-64, 1975. 11 p, 5 fig, 1 tab, 2 ref.

Descriptors: *Sediment transport, *Sampling, *Methodology, Research and development, Equipment, Pumps, Data collections, Sediment yield, Storm runoff.
Identifiers: *Sediment sampler.

The U.S. Geological Survey has used pumping-sediment samplers to study the sediment transport characteristics of small streams in Maryland for the last 10 years. Four different samplers developed by the Federal Inter-Agency Sedimentation Project were used to sample suspended sediment on five streams with drainage areas ranging from 1.2 to 54.6 square kilometres (0.47 to 21.1 square miles). A PS-62 sampler has been in continuous operation since its installation in 1966. The sampler provided satisfactory coverage for 139 of 220 storms between 1966 and 1975. Installation of a streamlined intake structure, commercial electrical power, and in-line battery chargers increased the reliability of the sampler from 32 percent in 1969 to 84 percent in 1973. It is estimated that the latest version of pumping samplers, the PS-69, would provide reliable service during 90 percent of the storms if the installation were properly designed and maintained. (Woodard-USGS)
W76-09843

THE MODIFIED FERNOW FROST GAGE,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
B. O. Wilen, and W. P. Mac Connell.
Soil Sci. 115(4), p 326-328, 1973.

Descriptors: *Gages, *Frost, *Instrumentation, Measurement, *Soil measurements, Depth.
Identifiers: *Fernow frost gage.

The Fernow Gage developed by Patric and Fridley was reported to give accurate measurements of soil frost penetration, except during periods of fast freezing and thawing when the tops of the gages were exposed to the weather and when soil frost penetration was shallow. These problems were caused by the heat conducted by the copper well-casing used to hold the gage. A modification solved the problem of the heat conduction by the well-casing by breaking the copper well-casing into short segments. The problem of the gage's inability to measure subsurface frost when the surface soil was unfrozen was also solved by inserting beads into the gage. The beads divided the gage into short compartments to prevent the whole column of ice from thawing when the surface soil thawed while the subsoil remained frozen.--Copyright 1974, Biological Abstract, Inc.
W76-09880

AIRBORNE DETECTION AND MAPPING OF OIL SPILLS, GRAND BAHAMAS,
Canada Centre for Remote Sensing, Ottawa (Canada), Data Acquisition Div.
For primary bibliographic entry see Field 5A.
W76-09891

DEVELOPMENT OF A BOAT AND HELICOPTER DEPLOYABLE OIL SLICK SAMPLER,
Marconsult, Inc., Santa Monica, Calif.
For primary bibliographic entry see Field 5A.
W76-09892

DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM, FINAL REPORT,
Aerojet Electrosystems Co., Azusa, Calif.
For primary bibliographic entry see Field 5A.
W76-09898

COAST GUARD'S RESPONSE TO SPILLED OIL,
Coast Guard Reserve, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W76-09915

COMPARATIVE STUDY IN MEASURING FLUID SURFACE TENSION AND FLUID CONTENT WITH THE AID OF ELECTRICAL RESISTANCE ELEMENTS 'IN SITU' AND IN THE LABORATORY, (IN FLEMISH),
For primary bibliographic entry see Field 2G.
W76-09923

STEADY-STATE METHOD OF MEASURING UNSATURATED HYDRAULIC CONDUCTIVITY,
Battelle Pacific Northwest Labs., Richland, Wash. Water and Land Resource Dept.
For primary bibliographic entry see Field 2G.
W76-09924

7C. Evaluation, Processing and Publication

HYDROLOGIC SYSTEMS ANALYSIS MODEL FOR GENERATING RUNOFF TIME SERIES (HIDROLOGIAI) RENDSZERVIZSGALATI MODELL VIZHOZAMIDOSER ELOALLITASARA (II. RESZ),
BME Institute for Water Resources and Hydraulics, Budapest (Hungary).
For primary bibliographic entry see Field 2A.
W76-09557

MONITORING WELLS,
Oregon State Engineer's Office, Salem.
For primary bibliographic entry see Field 4B.
W76-09558

A THREE-DIMENSIONAL GALERKIN FINITE ELEMENT SOLUTION OF FLOW THROUGH MULTIAQUIFERS IN SUTTER BASIN, CALIFORNIA,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 2F.
W76-09562

RESEARCH AND INVESTIGATION OF GEOLOGY, MINERAL, AND WATER RESOURCES OF MARYLAND.
Geological Survey, Baltimore. Maryland
For primary bibliographic entry see Field 4A.
W76-09565

EVALUATION OF MEAN SQUARE ERROR INVOLVED IN APPROXIMATING THE AREAL AVERAGE OF A RAINFALL EVENT BY A DISCRETE SUMMATION,
Puerto Rico Univ., Mayaquez. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W76-09572

SENSITIVITY OF LINEAR AND NONLINEAR SURFACE RUNOFF MODELS TO INPUT ERRORS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2A.
W76-09578

ON LONG-TERM STABILITY OF ZOOPLANKTON COMPOSITION,
Uppsala Univ. (Sweden). Inst. of Limnology.
For primary bibliographic entry see Field 5C.
W76-09600

ON THE CAPACITY-EXPANSION OF DESALINATION PLANTS AND STORAGE TANKS,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 3A.
W76-09618

DESIGN OF WATER RESOURCES PROJECT WITH INADEQUATE DATA IN INDIA - GENERAL AND PARTICULAR CASE STUDIES,
International Hydrological Decade, New Delhi (India). Indian National Committee.
For primary bibliographic entry see Field 4A.
W76-09621

DATA REQUIREMENTS FOR THE OPTIMIZATION OF RESERVOIR DESIGN AND OPERATING RULE DETERMINATION,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 4A.
W76-09622

THE DESIGN OF WATER QUALITY MANAGEMENT PROJECTS WITH INADEQUATE DATA,
Oklahoma Univ., Norman.
For primary bibliographic entry see Field 5G.
W76-09623

OPTIMAL ACTIVATED SLUDGE DESIGN UNDER UNCERTAINTY,
Auburn Univ., Alabama. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W76-09628

A COMBINED MODEL FOR OPERATING IRRIGATED AGRICULTURAL SYSTEMS UNDER UNCERTAINTIES,
Technion - Israel Inst. of Tech., Haifa. Lowdermilk Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-09634

HYDROLOGY FOR ENGINEERS, SECOND EDITION,
Stanford Univ., Calif.
For primary bibliographic entry see Field 8B.
W76-09661

USE OF THE COMPUTER PROGRAM 'STORM' FOR ANALYSIS OF THE QUANTITY AND QUALITY OF URBAN STORM WATER RUNOFF,
Hydrologic Engineering Center. Davis, Calif.
For primary bibliographic entry see Field 5B.

W76-09740

THE CONTRIBUTION OF A WATER INFORMATION SYSTEM FOR ENVIRONMENTAL PLANNING IN MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Geography.
For primary bibliographic entry see Field 6G.
W76-09753

GRAVITY GEOPHYSICS FOR GROUNDWATER EXPLORATION IN GLACIATED AREAS,
Michigan State University, East Lansing. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W76-09758

COMPUTER ESTIMATES OF NATURAL RECHARGE FROM SOIL MOISTURE DATA - HIGH PLAINS OF COLORADO,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W76-09761

RECONNAISSANCE MAP SHOWING RELATIVE AMOUNTS OF SOIL AND BEDROCK IN THE MOUNTAINOUS PART OF THE MORRISON-EVERGREEN QUADRANGLES AND ADJOINING AREAS TO THE WEST IN JEFFERSON COUNTY, COLORADO,
Geological Survey, Reston, Va.
P. W. Schmidt.
Miscellaneous Field Studies Map MF-740, 1976. 1 sheet, 5 ref.

Descriptors: *Maps, *Soil structure, *Bedrock, Septic tanks, *Water pollution sources, Soil aggregates, Soil compaction, Soil density, Mapping, Aerial photography, Geological surveys.
Identifiers: Morrison-Evergreen quadrangles(Colo).

This map shows the relative amounts of soil and hard bedrock within the upper 6 feet (1.8 m) of the land surface. It provides information useful for broad-scale land-use decisions. The map is based on reconnaissance field studies and aerial-photograph interpretation. Although the unconsolidated materials in this area are easily excavated for septic systems with leach fields, the seasonal rise of the water table and local inundation of the surface make this area one of high potential constraint. Only after careful site evaluation, especially during infiltration of the spring snowmelt, can this area be considered safe for septic systems with leach fields. Along major valleys, septic systems with leach fields may drain through highly permeable alluvial gravels and contaminate nearby streams. Septic systems with leach fields should be restricted to those few areas where acceptable amounts of unconsolidated material can be located on suitable slopes or where pervious fill can be added. (Woodard-USGS)
W76-09825

HYDROLOGIC UNIT MAP--1974, STATE OF ALASKA,
Geological Survey, Reston, Va.
Hydrologic Unit Map, 1976. 1 sheet.

Descriptors: *Maps, Hydrology, *Alaska, *Water resources, Data collections, Planning, *Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Alaska), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Alaska that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U. S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U. S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U. S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W76-09826

HYDROLOGIC UNIT MAP--1974, STATE OF OREGON,
Geological Survey, Reston, Va.
Hydrologic Unit Map, 1976. 1 sheet.

Descriptors: *Maps, *Hydrology, *Oregon, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Oreg), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Oregon that are basically hydrographic in nature. The Cataloging Unit shown will supplant the Cataloging Units previously used by the U. S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U. S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W76-09827

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1974,
Geological Survey, Austin, Tex.
H. D. Buckner.
Open-file report, May 1976. 13 p, 1 fig.

Descriptors: *Hydrologic data, Surface waters, *Streamflow, *Reservoirs, *River basins, *Texas, Rainfall, Runoff, Water yield, Water storage, Lakes.
Identifiers: *Mountain Creek(Tex), Trinity River basin(Tex).

Surface-water runoff and storage data collected during the 1974 water year in the Mountain Creek basin, Texas, are presented. Basin outflow for the water year was 80,480 acre-ft which is 7,310 acre-ft above the 14-year (1960-74) average of 73,170 acre-ft. Storage in Mountain Creek Lake showed a net loss of 1,030 acre-ft during the water year. Rainfall over the area was about 35 inches, which is about 1 inch above the long-term mean (1960-74). (Woodard-USGS)
W76-09829

REPORT OF WATER LEVELS IN SELECTED OBSERVATION WELLS IN UTAH--APRIL 1976,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W76-09832

PROPOSED REVISION TO THE MODIFIED EINSTEIN METHOD OF COMPUTING TOTAL SEDIMENT DISCHARGE,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W76-09842

EFFECT OF SEQUENCE LENGTH N ON THE CHOICE OF ASSUMED DISTRIBUTION OF FLOODS,
IBM Thomas J Watson Research Center, Yorktown Heights, N. Y.
For primary bibliographic entry see Field 4A.
W76-09851

LAND USE CHANGES AND RESERVOIR DEVELOPMENT: AN APPLICATION OF LAND USE INFORMATION SYSTEMS,
Oklahoma State Univ., Stillwater. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W76-09905

OPERATIONAL MODEL FOR PREDICTING THE MOVEMENT OF OIL IN CANADIAN NAVIGABLE WATERS,
Canada Centre for inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-09908

RIVER DELTA COMPUTER SIMULATION MODEL (SIMUDELT),
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-09954

8. ENGINEERING WORKS

8A. Structures

SIOUX FALLS RESTORES FOUR WELLS WITH COLLECTOR PIPE,
Sioux Falls Water Dept. S. Dak.
For primary bibliographic entry see Field 3B.
W76-09510

RELATIONSHIP OF RATIONAL AND UNIT GRAPH METHODS IN RETENTION BASIN DESIGN,
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4C.
W76-09732

CONCEPT ANALYSIS: OFFSHORE BREAKWATER-OIL STORAGE SYSTEM,
Raymond Technical Facilities Inc., New York.
J. Peraino, and T. Plodowski.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A010 348, $4.50 in paper copy, $2.25 in microfiche. Department of the Army Coastal Engineering Research Center Miscellaneous Paper No. 4-75, April 1975. 66 p, 23 fig, 4 tab, 7 ref, append. DACW72-73-C-005.

Descriptors: *Offshore platforms, *Breakwaters, *Oil industry, *Resources development, Continental Shelf, Environmental effects, Water resources, Storage, Deepwater, Harbors, Construction, Design.
Identifiers: *Deepwater ports, *Superports, *Petroleum, *Ports, U. S. East Coast, Breakwater-storage.

A satisfactory method of providing a prompt and efficient answer to the fast-growing need for deep-draft berthing facilities along the U. S. east coast is studied. The general concept of large hollow precast floating units towed to the site, and sunk into position lends itself particularly to using the hollow interiors as storage space for liquid bulk cargo in large quantities. Since the trend for more economical transportation of petroleum products is by use of large deep-draft carriers, the combination breakwater-oil storage system is a possible

solution. Assumptions were made as to probable site conditions, i.e., water depths, sea conditions, bottom conditions, and a preliminary design developed for the units. Various construction procedures were studied and compared from both technical and construction cost aspects. Once all technical advantages and disadvantages had been considered, the most suitable design was completed, a construction procedure laid out, and a basic budget estimate prepared. With this basic estimate, it was possible, with a series of factors, to adjust this basic cost to other water depths and other locations. Design principles, construction procedures and cost estimates are detailed in the report, including basic assumptions, sample design calculations, and estimate breakdown. (Sinha - OEIS)
W76-09904

8B. Hydraulics

SIOUX FALLS RESTORES FOUR WELLS WITH COLLECTOR PIPE,
Sioux Falls Water Dept. S. Dak.
For primary bibliographic entry see Field 3B.
W76-09510

ENERGY DISSIPATION ON A ROUGH SLOPE,
Massachusetts Inst. of Tech., Cambridge Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
O. S. Madsen, and S. M. White.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW1, Proceedings Paper 11904, p 31-48, February 1976. 7 fig, 2 tab, 9 ref, 2 append.

Descriptors: *Coastal engineering, *Coastal structures, *Ocean waves, Unsteady flow, Energy dissipation, Slopes, Mathematical studies, Breakwaters, Waves(Water), Reflectance.
Identifiers: *Energy dissipators, Wave dispersion, Wave runup.

Assuming long normally incident waves, described by linear theory, the energy dissipation on a rough slope was accounted for by introducing a term expressing the bottom shear stress. The theoretical development leads to a determination of the reflection coefficient as a function of the horizontal extent of the slope relative to the wave length in front of the slope and an equivalent slope friction factor. A method for the accurate determination of the reflection coefficient from experimental data was developed and used to establish an empirical relationship for the frictional characteristics of a rough slope. The resulting semi-empirical procedure for estimating the reflection coefficient of rough slopes was shown to yield fairly accurate results. The results showed that bottom friction may account for the dissipation of 80% of the incident wave energy on a slope as large as 1:3 where the incident waves show no sign of breaking. (Morris - ISWS)
W76-09582

TRANSVERSE FORCES ON VERTICAL CYLINDERS IN WAVES,
Cambridge Univ. (England). Dept. of Engineering.
M. de St. Q. Isaacson, and D. J. Maull.
Journal of the Waterways, Harbors, and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW1, Proceedings Paper 11934, p 49-60, February 1976. 10 fig, 18 ref, 2 append.

Descriptors: *Coastal engineering, *Coastal structures, *Underwater, *Piles(Foundations), *Ocean waves, Hydraulic models, *Waves(Water), Model studies, Laboratory tests, Vortices.
Identifiers: Lift, Pile structures, Transverse waves.

The results of a laboratory investigation into the development of forces on a vertical circular cylinder in regular waves were presented. The force transverse to the direction of waves propagation was examined in detail and its relation to the shedding of vortices was considered. It found that the Keulegan-Carpenter number is important in determining whether lift forces will be developed and at what frequency compared with the wave frequency. The unsteady pressure distribution round the cylinder at various depths has been measured and the sectional forces derived from these distributions. The flow in waves has been compared with that round a circular cylinder oscillating in still water. (Morris - ISWS)
W76-09583

LONGITUDINAL DISPERSION COEFFICIENTS FOR STREAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W76-09589

INFLUENCE OF HYDRAULIC TROUGH AND LATERAL JOINTS ON THE GROUNDWATER POTENTIAL OF THE MASSIVE TRAP UNIT AT TANORIA IN SHAJAPUR DISTRICT (MP),
Central Ground water Board, Nagpur (India).
For primary bibliographic entry see Field 4B.
W76-09614

DESIGN OF WATER RESOURCES PROJECT WITH INADEQUATE DATA IN INDIA - GENERAL AND PARTICULAR CASE STUDIES,
International Hydrological Decade, New Delhi (India). Indian National Committee.
For primary bibliographic entry see Field 4A.
W76-09621

DATA REQUIREMENTS FOR THE OPTIMIZATION OF RESERVOIR DESIGN AND OPERATING RULE DETERMINATION,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 4A.
W76-09622

MAXIMUM INFORMATION OBTAINABLE FROM INADEQUATE DESIGN DATA: FROM MULTIVARIATE TO BAYESIAN METHODS,
Arizona Univ., Tucson. Dept. of Management.
For primary bibliographic entry see Field 4A.
W76-09625

EVALUATION OF FLOOD CONTROL UNDER CHANGING CONDITIONS,
Tokyo Univ. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-09630

HYDROLOGY FOR ENGINEERS, SECOND EDITION,
Stanford Univ., Calif.
R. K. Linsley, M. A. Kohler, and J. L. H. Paulhus.
McGraw-Hill, New York, N. Y. 1975. 482 p.

Descriptors: *Hydrologic data, *Engineering, *Hydrologic aspects, Climatic data, Precipitation(Atmospheric), Streamflow, Evaporation, Transpiration, Subsurface waters, Groundwater, Hydrographs, Runoff, Probability, Synthetic hydrology, Stochastic processes, Mathematical studies, Sedimentation, Channel morphology, Flooding, Floodwater, Watersheds(Basins).
Identifiers: *Engineering hydrology.

Hydrology describes the occurrence, circulation, distribution, and chemical and physical properties of the earth's waters. Engineering hydrology includes those segments of the field pertinent to design and operation of engineering projects, mainly hydraulic structures, for the control and use of water. Data collection and methods of analysis are broad catagories encompassing the design phase of hydrological engineering. Other factors which affect hydrologic conditions are weather, precipitation, streamflow, evaporation, transpiration, and subsurface water. Probability and stochastic hydrology are important considerations in the design of hydrologic structures. Sedimentation and river basin morphology are topics which lend themselves to an understanding and development of watershed analysis and planning. Each of these subjects are treated individually and in combination to provide a broad base for the study of engineering hydrology. (Heiss-NWWA)
W76-09661

THE WIND DRIFT AND WAVE BREAKING,
Naval Research Lab., Washington, D.C. Ocean Sciences Div.
For primary bibliographic entry see Field 2L.
W76-09724

THE INFLUENCE OF URBANIZATION ON STREAM CHANNEL BEHAVIOR,
State Univ. of New York at Buffalo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W76-09744

WAVE BREAKING IN THE PRESENCE OF WIND DRIFT AND SWELL,
Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 2L.
W76-09874

ENGINEERING AND ECOLOGICAL EVALUATION OF ARTIFICIAL-ISLAND DESIGN, RINCON ISLAND, PUNTA GORDA, CALIFORNIA,
Blume (John A.) and Associates Research Div., San Francisco, Calif.
For primary bibliographic entry see Field 2L.
W76-09903

A POST CONSTRUCTION SURVEY OF SEVERAL MANMADE ISLANDS OFF THE COAST OF CALIFORNIA,
Dames and Moore, Los Angeles, Calif.
For primary bibliographic entry see Field 2L.
W76-09911

SYMPOSIUM ON MODELING TECHNIQUES, VOLUME I.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 2A.
W76-09941

HYBRID-ELEMENT METHOD FOR WATER WAVES,
Massachusetts Inst. of Tech., Cambridge, Dept. of Civil Engineering.
C. C. Mei, and H. S. Chen.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 63-81, 1975. 4 fig, 10 ref.

Descriptors: *Model studies, *Waves(Water), *Numerical analysis, Mathematical models, Computer models, Shallow water, Coasts, Harbors, Equations, Coastal engineering, Fluid mechanics, Hydraulics.
Identifiers: *Hybrid-element method.

A hybrid-element method for calculating water waves in an infinite fluid region was summarized. By introducing artificial boundaries the fluid region was divided into the finite-element region

which is the neighborhood of solid bodies and the super-elements which are the neighborhoods of infinity or of singular points. In the finite-element region polynomial interpolating functions were used to represent the unknown function approximately. In the super-elements infinite series solutions were used which satisfy exactly the governing equation and the boundary condition at infinity or at the singular point. Matching of the two regions at the common boundary was made easy by a special variational principle. Numerical computations only involved integrations in a finite domain and the inversion of a banded symmetric matrix. Examples for shallow water waves in a harbor were given. (See also W76-09941) (Sims - ISWS)
W76-09945

LARGE WAVE CHANNEL FOR 'FULL SCALE-MODELING' OF WAVE DYNAMICS IN SURF ZONES,
Technische Hochschule, Hanover (West Germany). Franzius-Institut fuer Grund und Wasserbau.
J. Grune, and A. Fuhrboter.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 82-100, 1975. 11 fig, 13 ref.

Descriptors: *Model studies, *Hydraulic models, *Facilities, *Waves(Water), Surf, Beaches, Equipment, Research equipment, Research facilities, Fluid mechanics, Flumes, Channels, Hydraulics.

Simulation of wave dynamics in models is an approved method for solving coastal engineering problems. However, recent investigations have shown that the strong interactions in surf zones can neither be reproduced in small scale models nor described by theoretical derivations. Scale effects due to air entrainment and to the scaling of beach materials (sand) and certain structure materials necessitate a 'modeling in full scale'. For this purpose, a full-scale wave channel is under preparation by 'SONDERFORSCHUNGBEREICH 79' at the University Hannover; the main dimensions of the channel are: full depth 7.2 m, maximum water depth 5.0 m, width 5.0 m, length 320 m. Regular waves or wave spectra with wave heights up to 2.0 m will be generated. A description of this large wave channel was presented and an example of the need for modeling surf dynamics in full scale was given. (See also W76-09941) (Sims - ISWS)
W76-09946

WAVE MOTIONS IN AN OFFSHORE HARBOR,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
O. S. Madsen, and Y. K. Vyas.
In: Symposium on Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 101-119, 1975. 12 fig, 1 tab, 9 ref.

Descriptors: *Model studies, *Waves(Water), *Nuclear powerplants, *Harbors, Hydraulic models, Breakwaters, Laboratory tests, Hydraulics.
Identifiers: *Offshore powerplants, Offshore harbors.

Results of an experimental investigation of wave induced oscillations in a model of an offshore nuclear power plant were presented. The purpose of the investigation was to compare experimental and theoretical results. The model was designed to reproduce as closely as possible the harbor model assumed in the theoretical study. A thorough calibration of the test facility was presented, including an estimate of the expected accuracy of the results. Experimental results showed a fair agreement with theoretical predictions for tests performed with an empty breakwater enclosure, whereas a definitely poor agreement was obtained for the case of bottom seated power plants in place within the breakwater enclosure. The poor agreement was attributed to real fluid effects not accounted for in the theoretical model. The conclusion of the study was that the accuracy of model tests of this type primarily is governed by the degree to which the wave absorbers lining the basin are perfect. It is also found that the requirement of locating the model within the region of uniform incident waves in some cases may be relaxed. This may enable testing of large models in test basins of reasonable size. (See also W76-09941) (Sims - ISWS)
W76-09947

MODELING OF WIND-WAVES WITH JONSWAP SPECTRA,
Chicago Bridge and Iron Co., Plainfield, Ill. Marine Research and Development.
S. K. Chakrabarti, and R. H. Snider.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 120-139, 1975. 12 fig, 9 ref, 1 append.

Descriptors: *Model studies, *Waves(Water), *Ocean waves, *Atlantic Ocean, Oceans, Winds, Storms, On-site investigations, On-site data collections, Mathematical models, Hydraulics.
Identifiers: *North Sea, *Wave spectra, Overshoot parameter, Spectral energy, JONSWAP wave spectra.

The Joint North Sea Wave Project (JONSWAP) spectra represent the best least square fit to the observed spectra during ideal generation conditions in the North Sea. It is more sharply peaked than the Pierson-Moskowitz spectrum for the fully-developed sea. The mean overshoot parameter for the North Sea Project was found to be 3.3. Wave energy spectra recorded during past and recent North Atlantic storms were compared here with the spectral model empirically derived during the Joint North Sea Wave Project. For these North Atlantic storms, the overshoot parameter was found to vary between 1 and 4.4. The overall comparison of the recorded unimodal energy spectra with the JONSWAP model was found to be generally good. Also, the measured significant wave heights correlated well with the significant JONSWAP heights. (See also W76-09941) (Sims - ISWS)
W76-09948

USE OF MATHEMATICAL MODELS IN THE PALO ALTO MARSHLAND REHABILITATION PROJECT,
Water Resources Engineers, Walnut Creek, Calif.
D. L. Tucker, D. F. Kibler, J. R. Monser, L. C. White, and B. L. Pawloski.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 140-158, 1975. 12 fig, 1 tab, 4 ref.

Descriptors: *Model studies, *Marshes, *Rehabilitation, *California, Mathematical models, Wetlands, Coasts, Tidal waters, Tidal marshes, Hydraulic properties, Flood control, Harbors.
Identifiers: *Palo Alto(Calif), Flood basins.

This paper described the recent use of mathematical models in the Palo Alto marshland restoration and Yacht Harbor study conducted by Water Resources Engineers for the City of Palo Alto. The 600 acre marshland area to be restored presently serves as a flood basin created 25 years ago by perimeter levees and a tidal headworks which closed the basin to tidal inflows from San Francisco Bay. The basin area has been designated recently by the City as a wetland preserve in which it is desired to establish a balanced marsh habitat having both fresh and salt water communities. At the same time, the restored marshland must retain its present function as a flood storage basin for protection of the City during periods of excessive urban runoff and high tides. The primary objective of the study thus was to devise and simulate hydraulic measures for introducing an artificial tidal circulation in the Flood Basin which also would meet the essential flood storage requirements. A second objective was to simulate the increase in hydraulic circulation and reduction in channel shoaling in the adjoining Yacht Harbor resulting from controlled Flood Basin releases. Details of the model structure for both the Flood Basin and Yacht Harbor, together with their respective roles in guiding engineering judgment, were provided. Sedimentation and other environmental factors were also discussed. (See also W76-09941) (Sims - ISWS)
W76-09949

SOME HARD LESSONS IN NUMERICAL HYDRAULICS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
R. H. Multer.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 208-219, 1975. 7 ref, append.

Descriptors: *Model studies, *Hydraulic models, *Mathematical models, *Numerical analysis, Hydraulics, Mathematics, Mathematical studies, Computer models, Equations.
Identifiers: *Boundary conditions.

Methods which may be used to solve problems in numerical hydraulics were surveyed. Available techniques have been used satisfactorily in a number of numerical studies. There are, however, basic pitfalls which may trap the unwary modeler and cause him to produce highly erroneous results. The most significant of these would seem to be the improper specification of boundary conditions and/or careless interpretation of numerical results relative to the boundary condition specified. The problem of boundary conditions is not a special characteristic of numerical models; it also occurs in physical model studies. Boundary conditions may be particularly troublesome in investigations in which modifications of the hydraulic system are to be studied. Numerical modeling results should be carefully examined to determine if system modifications are influencing boundary conditions. If this is the case, it may be essential to use alternate boundary conditions. (See also W76-09941) (Sims - ISWS)
W76-09952

SIMULATION OF TIDAL HYDRODYNAMICS - MASONBORO INLET,
Water Resources Engineers, Inc., Austin, Tex.
F. D. Masch, and R. J. Brandes.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 220-239, 1975. 8 fig, 11 ref. CERC DACW72-72-C-0028.

Descriptors: *Model studies, *Inlets(Waterways), *Mathematical models, *North Carolina, Channels, Jetties, Estuaries, Coasts, Velocity, Tides, Tidal waters, Flow, Hydraulics, Hydrodynamics.
Identifiers: *Masonboro Inlet(NC).

A two-dimensional finite difference tidal hydrodynamics model has been adapted to Masonboro Inlet, North Carolina. The model was calibrated for prototype conditions of September and October, 1969. Operational runs simulated tides and currents corresponding to pre-project undeveloped inlet conditions of November 1964, and modified inlet and north jetty conditions of June 1967. For each case, the model was operated with mean and spring tides. The model applied uses an explicit numerical solution of the two-dimensional equations of motion and continuity. It accounts for the effects of variable bathymetry, bottom roughness, tidal inundation, wind setup, weir flow over a section of the jetty and other system features. Because of the size and detail required in the simulations, a dual-model approach was employed. In this procedure, a coarse grid model was used to compute tidal flows which were then applied as boundary conditions to a fine grid sub-model of the immediate inlet area. Verification of the dual-grid model was accomplished through comparisons of measured and simulated tides at six gage locations and measured and simulated tidally generated velocities at fifteen stations throughout the inlet area. Further verification was obtained through comparisons of tidal prisms in selected areas common to the coarse and fine grid models. Results of operating the models under different ocean tides and with pre- and post-project bathymetry included water surface elevation and tidal velocity simulations at each of the stations used in the model verification. (See also W76-09941) (Sims - ISWS)
W76-09953

ANISOTROPIC SAND TRANSPORT IN TIDAL INLETS,
Foundation for Ocean Research, San Diego, Calif.
For primary bibliographic entry see Field 2L.
W76-09955

MODELING SEDIMENT MOVEMENT FOR MASONBORO INLET,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 2L.
W76-09956

MASONBORO INLET FIXED-BED MODEL EVALUATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. C. Seabergh, and C. Mason.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 294-314, 1975. 10 fig, 4 tab, 3 ref.

Descriptors: *Hydraulic models, *Evaluation, *Inlets(Waterways), Velocity, Flow, Tides, Waves(Water), Ocean waves, Model studies, Coasts, Beaches, Estuaries, Jetties, Hydraulics.
Identifiers: *Masonboro Inlet(NC).

An evaluation of state-of-the-art tidal inlet hydraulic model procedures was performed to determine the usefulness and reliability of a physical model to accurately predict the hydraulic characteristics of an inlet-bay system. Masonboro Inlet, a single-jettied inlet on the North Carolina coast, was selected as the prototype. The Masonboro Inlet tidal model was constructed to scales of 1:300 horizontally and 1:60 vertically. Model calibration tests assured that the model tidal heights and velocities were in agreement with those of the prototype 1969 conditions. To evaluate the model's predictive capability under different conditions, an additional set of hydraulic data was collected in July 1974, after the inlet thalweg had migrated further northward against the jetty. Tidal heights, velocities, and surface flow patterns using dye streaks were obtained in the prototype. The model was remolded to the 1974 bathymetry, and data were collected at identical locations as in the prototype. Using the same roughness distribution as the verified 1969 condition, velocity and tides were shifted one-half hour due to too much roughness at the entrance because of the narrower but deeper cross section. Model bay tide ranges were 11% less than the prototype and velocities averaged 0.6 ft/sec different than prototype, although the average difference in maximum velocities was only 0.3 ft/sec. Model dye streak patterns showed good agreement with the prototype when wind waves were reproduced, better than a nonwave condition. Also wave reproduction improved model-prototype velocity comparisons at the inlet entrance. (See also W76-09941) (Sims-ISWS)
W76-09957

PRINCIPLE OF MANAGEMENT OF DEGENERATED INLETS AND ESTUARIES,
Laval Univ., Quebec. Dept. of Civil Engineering.
M. Frenette, Y. Ouellet, A. Poire, and J-L. Verrette.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 315-334, 1975. 12 fig, 1 tab, 13 ref.

Descriptors: *Management, *Inlets(Waterways), *Model studies, Hydraulic models, Estuaries, Coasts, Channels, Erosion, Sedimentation, Salinity, Saline water intrusion, Tides, Waves(Water), Rivers, Discharge(Water), Hydraulics.

Efficient and proper utilization of inlets and estuaries requires a good knowledge of the evolution of the physical, hydraulic, sedimentological and biological components. Very often, a management can serve a cause to the detriment of another one. Research on scale model has been undertaken in order to define some principles of solutions for the management of degenerated inlets and estuaries so that a channel could be created without bringing too much change to the other aspects of the inlets or estuaries. The model itself represented a river interconnected with a maritime basin by means of an estuary. Fluvial hydrograms, sediment histograms, bed morphology, tides, salt-water and freshwater, and coastal currents and waves, as well as different techniques of management, were simulated in the model. (See also W76-09941) (Sims-ISWS)
W76-09958

PARTICLE-LADEN JETS WITH APPLICATION TO OCEAN DUMPING,
Delaware Univ., Newark. Dept. of Civil Engineering and Marine Studies.
For primary bibliographic entry see Field 5B.
W76-09959

PHYSICAL MODEL OF DISCHARGE IN A TWO-LAYER STRATIFIED AMBIENT,
Duke Power Co., Charlotte, N. C.
B. L. Sill, and B. L. Edge.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 388-406, 1975. 13 fig, 1 tab, 12 ref.

Descriptors: *Model studies, *Stratification, *Jets, *Reservoirs, Hydraulic models, Density stratification, Pumped storage, Mixing, Buoyancy, Thermal stratification, Conductivity, Measurement, Instrumentation, Dye releases, Diffusion, Dispersion.

A physical model was used to study the degree of mixing produced by neutrally buoyant discharges into stratified ambients. The discharge was located at the interface between the hypolimnion and the epilimnion to produce as much mixing from these two layers as possible. The physical model used a salt solution to create the original stratification. The most important results were: (1) large volumes and surface areas (over 1000 gallons and 150 sq ft) can be stratified quickly and uniformly with the floating diffuser technique developed; (2) except in the zone of flow development, visual and conductivity measurements show that the discharge moves as an interlayer between the epilimnion and hypolimnion and does not effectively mix fluid from above and below; (3) a simple analytical model developed to describe plume movement into a stagnant thermocline agrees well with experimental values; and (4) for condition test, discharge into the epilimnion did not adversely affect the stratification in the far field. (See also W76-09941) (Sims - ISWS)
W76-09963

NUMERICAL TWO-DIMENSIONAL FLOW MODEL FOR RIVER SYSTEMS,
Waterloo Univ. (Ontario). Dept. of Systems Design.
For primary bibliographic entry see Field 2E.
W76-09964

TWO-DIMENSIONAL MODEL OF FLOW TOWARD INTAKES,
Nuclear Regulatory Commission, Washington, D.C. Hydrologic Engineering Section.
For primary bibliographic entry see Field 2E.
W76-09965

MATHEMATICAL MODELING OF ALLUVIAL CHANNELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
Y. H. Chen, and D. B. Simons.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 466-483, 1975. 8 fig, 2 tab.

Descriptors: *Model studies, *Alluvial channels, *Mississippi River, Mathematical models, Erosion, Sedimentation, Sediments, Geomorphology, Channel morphology, Rivers, River beds, Sand waves, Flow, Unsteady flow, Streamflow.

For study of the important aspects of the unsteady flow phenomena in alluvial channels, a mathematical model was utilized to represent the original hydraulic system. The model was developed by formulating the unsteady flow of sediment-laden water with the one-dimensional partial differential equations representing the conservation of mass for sediment, and the conservation of mass and momentum for sediment-laden water. The effects of lateral water and sediment inflow, the sediment motion, the fluid friction, and the irregular channel geometry were considered. The set of equations were solved by a linear-implicit method using a digital computer. The mathematical model developed was valuable for studying various types of unsteady flow problems in open channels such as the flood routing of water and sediment in channels, degradation and aggradation near hydraulic structures, and channel response to development. To test the mathematical model two practical applications were analyzed. First, a mathematical model was used to simulate the propagation of sand waves in a laboratory flume. Second, a mathematical model was utilized to study the geomorphic changes in the Upper Mississippi River and the adjacent land. The simulated flows generated by the mathematical model compared well with field measured data. (See also W76-09941) (Sims - ISWS)
W76-09968

UNDISTORTED MOVABLE-BED MODEL STUDY FOR A RIVER AND POWER PLANT INTAKE SYSTEM,
Battelle Memorial Inst., Richland, Wash.
Y. Onishi, M. J. Hroncich, and W. W. Sayre.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 521-539, 1975. 10 fig, 5 tab, 6 ref, 2 append.

Descriptors: *Model studies, *Intakes, *Rivers, *Powerplants, *Missouri River, Nuclear powerplants, Hydraulic models, Sediments, Suspended solids, Structures, Intakes structures, Hydraulic structures, Hydraulics.

Undistorted movable-bed model similarity criteria for quasi-steady flows around and inside hydraulic structures located along curved alluvial streams were developed. These similarity conditions were applied to a model study of flow conditions and sediment movement of the Missouri River in the vicinity of and within an intake structure of the Cooper Nuclear Station, near Brownville, Nebraska. The test results confirmed their applicability. The model study revealed that a combination of trailing wall and skimming weir placed parallel to the face of the intake structure was the most effective sediment-reducing scheme that also satisfies the Corps of Engineers channel-encroachment constraint. This scheme was installed in the Missouri River in August 1974, and has resulted in significant reduction in size and quantity of sediment entering the circulating/service water systems. (See also W76-09941) (Sims - ISWS)
W76-09971

PHYSICAL MODELING TECHNIQUES USED IN RIVER MODELS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. River Regulation Branch.
For primary bibliographic entry see Field 2E.
W76-09972

RIVERBANK RECESSIONS FOR POWER PLANT FACILITIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
M. A. Stevens, Y. H. Chen, and D. B. Simons.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 560-574, 1975. 9 fig, 1 tab, 1 ref.

Descriptors: *Model studies, *Intakes, *Rivers, Intakes structures, Powerplants, Sediments, Sedimentation, Flow, Vortices, Hydraulic models, Hydraulics, Banks.
Identifiers: *Riverbank recessions.

Docking facilities and cooling water intake structures along large rivers are sometimes expensive and difficult to construct because of bankline instabilities and large velocities in the river. These difficulties can be overcome by excavating a recession in the river bankline for the facilities. Within the recession, the flow field is characterized by one or more large vortices with vertical axis. The vortices pump sediment and floating debris from the main channel into the recession and cause increased turbulence levels along the bankline immediately downstream of the recession. Because of the vortex motion, it is expedient to locate the cooling water discharge structure outside and downstream of the recession. To obtain information to assist in the design of a bank recession, a 1/50-scale rigid-bed hydraulic model of a 1-mile reach of the Lower MIssisippi River channel was tested. Velocity fields were measured in the model channel and recession and the movements of lightweight sediment and surface debris were mapped. These data and Toffaleti's sediment transport equations were used to estimate sedimentation rates in the recession. The shape and orientation of the recession was varied to achieve a good compromise solution for design. (See also W76-09941) (Sims - ISWS)
W76-09973

MODELING SEDIMENT TRANSPORT IN HYDRAULIC STRUCTURES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W76-09975

SYSTEMS MODELING OF STRATIFIED FLUIDS,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Center.
M. B. Abbott, J. Aa. Bertelsen, A. Kej, and I. R. Warren.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 605-624, 1975. 4 fig, 5 ref.

Descriptors: *Mathematical models, *Stratified flow, *Hydraulics, Sediment transport, Hydrodynamics, Water quality, Stratification, Salinity, Density, Flow, Velocity, Interfaces, Estuaries, Mathematics, Model studies, Computer models.
Identifiers: *Stratified fluids, Modeling techniques.

The 'design system' or 'computational system' builds and runs mathematical models of a given class when presented only with the basic model description. Two design systems for stratified flows were described: the S12/13 for one-dimensional two- and three-layer flows, and the S22/23 for two-dimensional two- and three-layer flows. Each system possesses hydrodynamic, transport-dispersion, and water quality stages. Together, these systems comprise the 'Neptune' project. Some specific difficulties and problems associated with the development of the systems were outlined, with illustrations. The systems approach appears to make possible the simulation of stratified flows and associated water quality phenomena with acceptable accuracy-cost characteristics. (See also W76-09941) (Sims - ISWS)
W76-09976

MODELING OF THREE-DIMENSIONAL FLOWS IN ESTUARIES,
Rand Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 2L.
W76-09977

EXPERIENCE WITH A SMALL SCALE, HIGHLY DISTORTED FIXED BED MODEL OF THE LAGO MARACAIBO ESTUARY,
Laboratorio National de Hidraulica, Caracas (Venezuela).
For primary bibliographic entry see Field 2L.
W76-09979

HYDRODYNAMIC AND MATERIAL TRANSPORT MODEL FOR MOBILE BAY, ALABAMA,
Alabama University, University. Department of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-09983

APPLICATION OF PHYSICAL TIDAL MODELS IN HARBOR AND MARINA DESIGN,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-09984

8C. Hydraulic Machinery

GIVE STORMWATER POLLUTANTS THE SPIN,
Municipal Environmental Research Lab., Edison, N.J. Storm and Combined Sewer Section.
For primary bibliographic entry see Field 5D.
W76-09461

CONSTRUCTION PLANNING OF A HYDRO POWER STATION,
Beas Designs Organization, Nangal (India).
O. P. Datta.
Indian Journal of Power and River Valley Development, Vol. XXV, No. 3, p 77-81, March 1975. 3 fig, 6 ref.

Descriptors: *Construction, *Planning, *Hydroelectric plants, Size, Excavation, Design, Water resources, Penstocks, Drainage, Equipment, Storage, Installation, Sites.
Identifiers: Concrete production.

Described are the important features that are associated with the planning and construction of a hydro power station. Factors governing the location of power-houses are discussed with relative merits, and criteria for the type and size of units are explained. Considered are excavation, concrete production and placement, penstock chamber, and drainage arrangements. Composite flow sheet charts for major construction operations of excavation and concrete production would help in judicious planning of sequential operations. After deciding the location and size of a hydro power station, it is advantageous to plan carefully the construction operations, starting from excavation and concrete placement to coordinated installation of generating equipment in order to achieve the targets of completion of the structure and to keep to the commissioning schedule. (Bell-Cornell)
W76-09616

OPTIMAL OPERATION OF THE PUMPING STATIONS IN THE KINNERETH-ESHKOL SECTION OF THE NATIONAL WATER CARRIER,
Mekoroth Water Co. Ltd., (Israel). Research and Desalting Div.; and Technion - Israel Inst. of Tech., Haifa.
For primary bibliographic entry see Field 4A.
W76-09629

OPERATION OF HYDROGENERATOR AS SYNCHRONOUS CONDENSOR,
Bharat Heavy Electricals Ltd., Hardwar (India).
S. C. Mukhopadhyaya.
Indian Journal of Power and River Valley Development, Vol. XXV, No. 4, p 113-115, April 1975. 4 fig, 4 ref.

Descriptors: *Hydroelectric plants, *Generators, *Condensers, Transmission line, Operations, Costs, Economic efficiency, Equipment.
Identifiers: *India.

A large number of hydro stations in India are either seasonal or peak load stations, and the generators in such stations have long idle time. This idle time of the generators can be economically used to run as synchronous condensors to reduce the transmission line losses and to utilize the available sources of power to maximum extent. Hydro stations mainly situated far away from the load centers, however, offer little advantage in running them as synchronous condensors. But there are many hydrostations in India around which industrial complexes or plants having large consumption of power have been constructed. These consumers are mainly supplied from the

nearby hydro stations. But sometimes power is fed from sources located at long distances. The analysis herein concludes that the running of hydro sets as synchronous condensors is very convenient and the expenditure involved in providing additional equipment is negligible. The modifications required to provide such facilities in existing power houses are also not much, as no change is involved in the main equipment. The only requirement is the provision of air inlet to runner chamber and some minor changes in control circuit. (Bell-Cornell)
W76-09637

A STUDY OF ROTATING-DISC TREATMENT UNITS OPERATING AT DIFFERENT TEMPERATURES,
Loughborough Univ. of Technology (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-09674

SLUICE GATES HELP REGULATE PLANT'S HYDRAULIC FLOWS.
Water and Sewage Works, Vol. 123, No. 5, p 77-79, May, 1976.

Descriptors: *Sluice gates, *Hydraulic gates, Hydraulic structures, *Flow control, *Sewage treatment, *Waste water treatment, Engineering structures, Gates, Sewage lagoons, Activated sludge, Sanitary engineering, Treatment facilities.
Identifiers: Contact stabilization.

A sluice gate arrangement for regulating hydraulic flows at a new Jackson, Mississippi, sewage treatment plant is described. The plant uses an activated sludge treatment process with contact stabilization and is designed so that influent must either be processed or temporarily stored in lagoons when flooding conditions exist. Comminuters and grit chambers in the plant make use of a 16-gate arrangement to control flows. Four 42 by 36-inch sluice gates are arranged around a comminuter pool controlling flows to four additional gates located at the grit chamber influent. Eight other gates are located on the grit chamber. Flow from the grit chambers passes on to the contact stabilization tanks, reaeration tanks, and ultimately to clarifiers. Four 48 by 48-inch gates located in the contact tanks and eight 30-inch diameter gates in the aeration tanks can be modulated to regulate flows in accordance with commands given by a control room operator who has access to flow meter readings. When the plant reaches its hydraulic capacity of 60 million gallons, excess flow is diverted to lagoons via a 60-inch diameter storm water bypass gate. Other gates at the plant include three self-contained gates at the effluent end of the chlorination lagoon and an additional modulating gate at the effluent outfall. (Kreager-FIRL)
W76-09680

HYDROELECTRIC POWER POTENTIAL AT CORPS OF ENGINEERS PROJECTS. RECOMMENDATIONS AND EXECUTIVE SUMMARY,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-09764

HYDROELECTRIC POWER POTENTIAL AT CORPS OF ENGINEERS PROJECTS,
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W76-09763

NEAR-FIELD JET PENETRATION AND RESERVOIR MIXING,
Georgia Inst. of Technology, Atlanta.
P. G. Mayer.
In: Symposium On Modeling Techniques, Volume I; 2nd Annual Symposium of the Waterways, Harbors and Coastal Engineering Division of ASCE (2 Vol.), San Francisco, California, September 3-5, 1975. American Society of Civil Engineers, New York, p 380-387, 1975. 4 fig.

Descriptors: *Model studies, *Hydraulic models, *Reservoirs, *Jets, Mixing, Dispersion, Circulation, Powerplants, Pump turbines, Pumped storage, Photography, Dye releases.
Identifiers: *Jet penetration.

The objectives were to build and operate hydraulic models which would (1) assist the Georgia Power Company in deciding on relative locations of the power house and the spillway in its Wallace Dam Pumped-Storage project, and (2) define factors pertinent to the locations of four reversible pump-turbine units and of two conventional turbine units within the power house. The laboratory investigations were conducted with two different models. One model was an idealized undistorted model built on a scale of 1:400. This model served to gather information useful to the construction and operation of a second and considerably more comprehensive reservoir model. The reservoir model was built on a distorted scale of 1:400 horizontally and 1:60 vertically. The models were operated on appropriate time-scales. Jet penetration and reservoir mixing were studied by means of dye injections. The operation of the reservoir model included both pumping cycles and generating cycles. Time-lapse color photography was used to study and analyze the jet geometrics and the jet induced reservoir mixing patterns. The results of these studies were immediately useful to the design engineers in the selection of a suitable configuration for turbine settings. The results to date were also useful in the examination of water quality aspects arising from the projects during operation. (See also W76-09941) (Sims - ISWS)
W76-09962

RIVERBANK RECESSIONS FOR POWER PLANT FACILITIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-09973

8G. Materials

POLYETHYLENE PIPE TACKLES DIFFICULT SEWER REPAIR JOB,
Water and Sewage Works, Vol. 123, No. 2, p 48, February, 1976.

Descriptors: *Sewers, *Repairing, *Plastic pipes, Installation.
Identifiers: Slip-lining, *Pipe relining.

A difficult sewer repair problem at La Mesa, California, was completed by the insertion of long, fused lengths of polyethylene pipe. A 55-year-old six-inch concrete sewer located in an area of beautifully landscaped homes on a steep, rocky hillside was badly in need of replacement due to heavy infiltration and exfiltration and stubborn root penetration which was causing stoppages. The first step was to inspect the line by video camera, recording the interior. Polyethylene pipe (OD 5.375 inches) was pulled through the pipe in 38-foot sections. As each section was lined, lateral connections were made. The project required five weeks to complete 3000 feet of relining; service was interrupted only when lateral connections were being effected. The final cost was much less than that of direct replacement. (Orr-FIRL)
W76-09403

HOW MANY SEWER LEAKS CAN YOU AFFORD.
Weston (Roy F.), Inc., Houston, Tex.
D. S. Diehl.
The American City and County, Vol. 91, No. 4, p 55-57, April, 1976.

Descriptors: *Sewers, *Sewerage, *Pipelines, *Infiltration, *Inflow, *Repairing, Measurement, Instrumentation, Drainage, Rainfall.
Identifiers: Sewerage construction grants, Infiltration/inflow.

The basic problems caused by infiltration/inflow (i/i) in a sewer system are: excessive maintenance, discharge of poorly treated waste water during periods of high groundwater or rainfall, backups and overflows of raw sewage, surchaged sewer lines which prevent the use of plumbing facilities in low-lying areas; and the overloading of treatment plants, pump stations and interceptors. Sewer systems are eligible for federally funded sewerage construction grants, provided an infiltration/inflow analysis demonstrates that it would be more economical to repair the sewers than to treat the i/i. In order to estimate the magnitude of i/i to which a system is subject, the peak, average and minimum flows during dry and wet weather for major sections must be determined. Three flow measuring devices generally used are Cipolletti weirs with liquid level recorders, event recorders, and bypass times. In evaluating the system, each manhole must be physically inspected on a drainage basin by drainage basin basis. In some systems, it is cost effective to smoke test the manhole and lines leading to it. Other steps in the evaluation include simulation of rainfall and quantification of the rate of infiltration or inflow from a particular source or suspected manhole or sewer section. Those lines with obvious potential for 'excessive' i/i should be cleaned and internally inspected with closed circuit TV. A final evaluation report must show all i/i sources as well as justification and a method for rehabilitation and repair of specific sections. (Kramer-FIRL)
W76-09404

POLYETHYLENE PIPE INSERTION REHABILITATES OLD SEWERS,
Freeport Public Works, N. Y.
E. H. Prefer.
Water and Sewage Works, Vol. 123, No. 4, p 92-94, April, 1976.

Descriptors: *Sewers, *Pipelines, *Plastic pipes, *Inspection, Testing, Equipment, Repairing, Rehabilitation, Sewerage, Costs.
Identifiers: *Pipe relining.

Sewers can be rehabilitated with less cost and disruption by inserting a new polyethylene pipe inside the old sewer pipe than by replacing the whole pipline. The existing sewer line must be inspected before inserting new pipe; TV or other methods may be used for the inspection. Lengths of polyethylene pipe are joined by heat fusion, producing a joint as strong as the pipe itself. The new pipe is inserted by pulling it into the old pipe with a cable. When shallow house service lines are connected to deep sewers by vertical risers, an expandable connector can be inserted through the top of the riser. When excavation down to the connection spot is required, fusion saddles or, when conditions are wet, tapping saddles may be used. After the houses are connected, the annular space between the old and new sewer pipes is sealed. Such a renewal project was carried out in Freeport, New York, where many of the sewers were badly deteriorated and one section had caved in. The initial insertion involved lining a 565-ft length of lightly deteriorated 8-in. pipe. The sewer section that had caved in was replaced with clay pipe, but the parallel section on the other side of the street was lined with polyethylene pipe. No obstructions were encountered in lining the first section, but the second section, which had not been inspected immediately before insertion, became jammed with material flaking off the original pipe. The re-lining and reconnection were nevertheless completed in 5 days, at a savings of 90% as compared to the replacement of clay pipe on the other side of the street. (Snyder-FIRL)

W76-09459

SEWER INSPECTION: CHECKING IT OUT,
L. Fielding.
Water and Wastes Engineering, Vol. 13, No. 4, p 16, April, 1976.

Descriptors: *Sewers, *Maintenance, *Cleaning, Repairing, Inspection, Equipment, Maintenance costs.
Identifiers: *Television inspection.

Trends and commonly used techniques for sewer inspection and maintenance are discussed. Visual on-site inspection is the most commonly used inspection method. Closed circuit television cameras are becoming more commonly used. The sewers in Sparks, Nevada, are inspected visually in manholes and internally by a closed circuit television system. The visual inspection is performed weekly, while television inspection is performed on a time available basis. Rodders, vacuum units, electric eels, and buckets and brushes are all used to varying degrees to clean sewers. Tree roots are the most common problem found in routine maintenance. Slip-liner technology for the replacement of deteriorated mains is being considered by Oklahoma City. The frequency of inspection and maintenance depends on available manpower and time. Money is another important factor. At Sparks, Nevada, about 5% of the system is inspected visually weekly, 10% is cleaned every three months, 5% is cleaned every year, 15% is cleaned every two years, 20% is cleaned every five years, and about 40% is not cleaned. Approximately 48% of the utility budget of Sparks is spent on sewer inspection and maintenance. (Orr-FIRL)
W76-09460

GRP LAUNDERS AT SEWAGE TREATMENT PLANT.
Reinforced Plastics, Vol. 20, No. 2, p 44-45, February, 1976.

Descriptors: *Sewage treatment, Equipment, *Plastics, Construction materials, *Waste water treatment, Corrosion control, Treatment facilities.
Identifiers: Launders, *Reinforced plastics.

New glass fiber reinforced plastic (GRP) launders and diffusers have been developed for use in sewage treatment plants. These plastics give increased strength and a high surface finish, with the incorporation of high density polyurethane foam in their sandwich construction. These launders, or trough-shaped conduits, had formerly been constructed of concrete and steel. With the lighter reinforced plastic construction, the equipment will be easier to transport and hoist and will discourage the growth of algae. (Kramer-FIRL)
W76-09462

VALUE ENGINEERED SEWAGE PLANT MOVES FAST,
For primary bibliographic entry see Field 5D.
W76-09672

METHOD AND APPARATUS FOR THE CONVERSION OF AN AQUEOUS SCALE-FORMED LIQUID,
For primary bibliographic entry see Field 3A.
W76-09872

8I. Fisheries Engineering

EXPERIMENTS ON THE CULTURE OF THE LARGE SNAKE-HEAD OPHICEPHALUS MARULIUS (HAMILTON),
Reg. Cent., Mandapam Camp, Tamil Nadu, India, Cent. Mar. Fish. Res. Inst.
M. Devaraj.
Indian J Fish. 20(1), p 138-147, 1973.

Descriptors: *Fish, Swamps, Fish hatcheries, Wells, *Growth rates, Breeding.
Identifiers: Snake-Head, Ophicephalus-marulius, Tilapia-mossambica, Fish breeding.

The growth of fry and fingerlings of O. marulius is 32 mm/mo. in a swamp, 15.6 mm in a nursery, 6.4 mm in a backyard well and up to 29 mm in irrigation wells under different feeding conditions. During the 1st yr of the experiment in a farm pond where forage fishes were introduced, the monthly growth of 1 and 2 yr old O. marulius was 12 mm and 8 mm respectively. Eutrophification of the pond during the2nd yr increased the growth rate to 33 mm in fingerlings and 27 mm in 1 yr old fish. Survival of fingerlings during the 1st yr was 1.3% in the nursery, 13.6% in backyard wells and 34.0% in irrigation wells. Recovery from farm ponds where adult fishes were grown, ranged from 57.5 to 100% in a period of 1-1 1/2 yr. This was due to breeding in the pond which resulted in the production of younger fish of size-groups much smaller than those stocked. When the juveniles attained about 125 mm in length (4-5 mo. old) they became piscivorous and dispersed from the broods. They should be collected at this stage for stocking purposes. Rate of stocking in wells should not exceed 10 fish/well. For culture in farms, 0.25-0.5 ha ponds and a stock rate of 1000-4000 fingerlings/ha are suggested. Tilapia mossambica of less than 80 mm formed the chief food of O. marulius on the farm. Desparity in the growth rate within the same habitat increased cannibalism and hence mortality of smaller ones was high. The importance of periodic netting for the larger fish is emphasized.--Copyright 1975, Biological Abstracts, Inc.
W76-09487

ENGINEERING RECLAMATION, A MOST IMPORTANT MEANS OF INCREASING FISH PRODUCTIVITY OF WATERS, (IN RUSSIAN),
Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).
G. I. Shpet, and I. F. Demchenko.
Gidrobiol Zh. 9(4), p 87-90, 1973.

Descriptors: Fish management, *Fish reproduction, *Productivity, *Fisheries, Ponds, Fertilizers, Drainage, Fish diets, Grading.
Identifiers: *Engineering reclamation.

The application of feed and fertilizer is an important means of increasing the productivity of pond fisheries, but engineering reclamation is also important. The productivity of a pond depends on a number of hydrological conditions (pond area, depth, flow, drainability) which can be improved by engineering. Although there is no obvious proportional relationship between pond size and productivity, ponds with an area of 50-150 ha are the most productive since such ponds are more amenable to the use of mechanization and hydraulic engineering. Drainability, cultivation and grading of pond bottom are important features in engineering reclamation. A good reclamation system and graded bottom provide complete draining and shorten fish catching time by 3-4 times.--Copyright 1975,Biological Abstracts, Inc.
W76-09800

9. MANPOWER, GRANTS AND FACILITIES

9D. Grants, Contracts, and Research Act Allotments

NATIONAL CONFERENCE OF DISTRICT CHIEFS, ALBUQUERQUE, NEW MEXICO, SEPTEMBER 28-OCTOBER 3, 1975--PROCEEDINGS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 02A.
W76-09838

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

PHYSIOLOGIC RESPONSES TO WATER IMMERSION IN MAN: A COMPENDIUM OF RESEARCH,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
J. Kollias, D. Van Derveer, K. J. Dorchak, and J. E. Greenleaf.
NASA Technical Memorandum, TM X-3308, February, 1976, 74 p, 245 ref.

Descriptors: *Animal behavior, *Animal physiology, *Biology, *Bibliographies, *Abstracts, Environmental effects, Laboratory animals, Mode of action, Moisture stress, Reviews, Information retrieval, Environmental engineering, Manpower.
Identifiers: *Water immersion, Physiological responses(Human), Space flight, Weightlessness, Zero-gravity effects, Fluid immersion, Simulated environments.

Since the advent of space flight programs, scientists have been searching for ways to reproduce the zero-gravity effects of weightlessness. Brief periods of weightlessness up to 1 minute were feasible using Keplerian trajectory, but comprehensive study of the prolonged effects of the weightless state necessitated the development of other methods. Thus far the two approaches most widely used have been complete bedrest and fluid immersion. Surprisingly, these simulated environments have produced essentially all of the symptoms found in astronauts. This compendium contains reports appearing in the literature through December, 1973. When the author's abstract or summary was adequate, it was used. If these were not available a detailed annotation was provided under the subheadings: (a) purpose, (b) procedures and methods, (c) results, and (d) conclusions. The annotations are in alphabetical order by first author; author and subject indexes are included. Additional references are presented in the selected bibliography. (Katz)
W76-09655

BIOLOGICAL INDICATORS OF ENVIRONMENTAL QUALITY. A BIBLIOGRAPHY OF ABSTRACTS,
For primary bibliographic entry see Field 05A.
W76-09860

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ABSORPTION
A Quantitative Analysis of the Factors Affecting Plant Nutrient Uptake from Some Soils,
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W76-09860 5A

ACIDIC SOILS
Requirements and Use of Fertilizer, Lime, and Mulch for Vegetating Acid Mine Spoils,
W76-09469 4D

ACIDIC WATER
Acid-Iron Waste as a Factor Affecting the Distribution and Abundance of Zooplankton in the New York Bight: I. Laboratory Studies on the Effects of Acid Waste on Copepods,
W76-09700 5C

ACTIVATED CARBON
Carbon Wastewater Treatment Process,
W76-09441 5D

Sludge/Activated Carbon Cycle Treats Sewage.
W76-09443 5D

Carbon Made from Sewage Solids Treats Wastewater.
W76-09450 5D

ACTIVATED SLUDGE
Sewage Treatment Facility to be Updated and Expanded at Kitchener Ontario,
W76-09439 5D

Sludge/Activated Carbon Cycle Treats Sewage.
W76-09443 5D

Desert Area Activated Sludge Plant.
W76-09447 5D

Activated Sludge Process with Alum Addition and Heat Treatment,
W76-09456 5D

Some Critical Views of Selected Processes for the Biological Treatment of Sewage,
W76-09457 5D

Optimal Activated Sludge Design Under Uncertainty,
W76-09628 5D

Least Cost Design of Activated Sludge Systems,
W76-09638 5D

The Operation of a Simplex Activated Sludge Pilot Plant in an Atmosphere of Pure Oxygen,
W76-09669 5D

Purification of Waste Water By Polymer Exchangers (Jatevesien puhdistaminen polymeerivaihtajilla),
W76-09675 5D

Assessment of Virus Removal by a Multi-Stage Activated Sludge Process,
W76-09676 5D

The Effluent Lagoons Greifswald-Ladebow (Das Abwasserteichsystem Greifswald-Ladebow),
W76-09682 5D

Development of a Measurement Method for the Total Activity Rate of Activated Sludge (Contribution a La Mise Au Point D'une Methode De Mesure Du Taux D'Activite Totale Des Boues Activees),
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Laboratory Centrifuge Saves Time and Money,
W76-09704 5D

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W76-09712 5D

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Apparatus for Sewage Treatment and Wastewater Reclamation,
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W76-09429 5D

Wastewater Treatment System with Controlled Mixing,
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